LEARNING BY BLIND CHILDREN OF LOW ABILITY: THE RELATIVE EFFICIENCY OF READING AND LISTENING

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by

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This study was designed to investigate mode of learning, either braille reading or listening, for blind children with IQ's below 85. Ss were classified according to their relative performance on braille reading rate and comprehension in combination. Ss were presented with material representing second and sixth grade reading level. Half the Ss read passages in braille and half listened to pre-recorded tapes. Comprehension tests over materials revealed that the critical variable which determined mode superiority was level of braille reading comprehension. Ss with relatively high levels of braille reading comprehension learned more when reading in braille, while Ss with relatively low levels of comprehension learned more when listening, regardless of their reading rate and the difficulty level of the materials.

ABSTRACT

LEARNING BY BLIND CHILDREN OF LOW ABILITY: THE RELATIVE EFFECTIVENESS OF READING AND LISTENING

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Description

This study was designed to investigate mode of learning (M), either braille reading or listening, in blind children of low mental ability. Eighty Ss whose IQ's were below 85, from five residential schools for the blind, were grouped according to their relative performance levels of braille reading comprehension (C) in combination with reading speed (S). Ss were classified according to their performance above or below the median comprehension score and above or below the median reading rate on an adapted version of the Speed Test of the Gates Reading Survey. This classification resulted in the formation of four groups designated as high comprehenders with either fast or slow reading speeds or low comprehenders with fast or slow reading speeds. The four dichotomized groups were divided so that half of each read materials in braille and half read by listening. All Ss received two reading passages which had been determined to represent second and sixth grade reading level by readability formulas. Author made tests of comprehension were administered following the presentation of materials to measure the amount learned (dependent variable) when reading in each mode.

A four dimensional factorial design with repeated measures on one factor, difficulty level of the material (D), was used to analyze the data. Subject variables of CA and IQ were analyzed for the entire sample and according to operationally classified groups.

Results

Results of the analysis indicated that the critical variable which affects differential learning according to mode is pre-existing level of braille reading comprehension. The significant M x C interaction ($P < .05$) revealed that Ss with a high level of comprehension on the subject classification test learned more when reading in braille. Ss with a low level of reading comprehension learned more when listening. This relationship was not affected by reading speed or difficulty level of the material.

It had been expected that listening would prove the superior mode for all Ss, especially for more difficult materials. A significant main effect for (D) was obtained indicating Ss consistently learned more when reading the easier materials ($P < .001$). However, differences in learning with respect to mode of presentation were not apparent until the level of braille reading comprehension was taken into account. Classifying Ss on the basis of high or low comprehension caused the main effect for (C) to be significant ($P < .01$). Ss were not differentiated on the basis of reading speed nor did speed show any consistent relationship with other variables. The non-significant main effect for reading speed and the fact that it did not interact with other factors indicated that inter- and intra-

subject differences on this factor were highly variable for this sample of low IQ Ss on the task presented.

An analysis of subject variables indicated that dichotomized groups differed significantly with respect to CA and IQ. Level of reading comprehension appeared responsible for these differences. Older, brighter Ss comprehended more than their younger, less intelligent counterparts, regardless of the mode in which materials were read. CA and IQ were not consistently related to reading speed, though there was a tendency for older Ss with higher IQ's to read more rapidly.

Conclusions

These findings supported the increased use of the auditory channel for presenting materials to blind children of low ability for whom this mode is more effective for learning than braille reading. As level of braille reading comprehension appeared to be the factor responsible for the superiority of one mode over the other, educators were urged to evaluate this aspect of braille reading in their students in order to determine the most effective mode for the presentation of educational materials.

Introduction

A child with a severe visual handicap must learn a tactual analog to print symbology in order to gain access to a vast amount of the material considered necessary for his education. For many children, braille or print reading comes easily and increasing degrees of independence are attained throughout the educative process. There are, however, those children who, for one reason or another, never achieve sufficient reading mastery of a written, symbolic code. Democratic society places a great deal of emphasis on literacy and certainly efficient reading skills are highly desirable in a complex culture. However, if disproportionate amounts of school time are spent in acquiring mastery of a written code, children may be denied access to much information which could be useful to them, information they might acquire by auditory means. The visually handicapped child whose visual loss is such that he must learn a tactual symbolic code, braille, may be at a particular disadvantage, especially if there is an impairment in mental ability. In addition to the deprivation associated with the loss of major sensory channel through which information is gained about the environment, inadequate braille reading skills, regardless of their origin, may constitute an additional educational handicap.

Disadvantages Associated with Braille Reading

There are a number of disadvantages associated with braille reading. Two of these disadvantages which are of major importance will be briefly considered here.

The Braille Code and Methods of Teaching Braille Reading. Methods of teaching braille reading are more often than not quite similar to methods used in teaching print reading to sighted children (Lowenfeld & Abel, 1967). Recent research by Nolan and Kederis (1969, p. 47) established the individual braille character as the perceptual unit in braille reading. Braille readers do not read whole words but rather perceive the characters of the word sequentially over a temporal interval. This finding suggests that the widely used whole word approach for teaching reading may not be adequate for teaching tactual reading. Attempts to shorten the braille code which was originally devised with letter by letter correspondence, have introduced contractions which represent whole words or parts of words. Ashcroft (1960) has shown that many of these contractions may serve to confuse the braille reader rather than facilitate his perception. It becomes apparent that there are inherent disadvantages of braille reading as compared with print reading which are a result of the structure of the code, the perceptual processes involved and perhaps, even the way in which it is taught.

Braille Reading Rates. Another disadvantage of braille reading which has plagued educators of the blind is the extremely slow reading speeds which exist for most tactual readers. Reading rates for blind children in the intermediate through high school grades range from 50 to 86 words per minute (Appendix A, Part 1). The range of reading rates for sighted readers in grades 4-12 is 155-251 wpm (Harris, 1961, p. 508). Slow reading rates limit the amount of educational material a blind student is able to cover independently during the course of his education

and may, in some cases, constitute an unequal opportunity to profit from the educational experience. When the additional handicap of low mental ability is present, these differences are magnified. Nolan and Kederis found that blind high school students with an average IQ of 75, read at about 40 wpm (1969, p. 132). They concluded that not only do braille readers of retarded intellectual ability read slower, they comprehend less and make less use of cues available to them such as word length, familiarity, and orthography. Sighted readers tend to increase their reading rates once mastery of print symbology has been accomplished. There is little evidence to support the fact that braille readers follow a similar pattern. Rates do not increase markedly from the elementary to high school years. There are those individuals who read braille at rapid rates, but even the most rapid of these do not compare with speeds of rapid print readers. Hayes (1920) was among the first to raise the question of whether or not we are justified in spending the amount of time necessary for adequate mastery of braille reading when tactual reading speeds continue to be discrepant from visual reading speeds. Today, fifty years later, this question is still before us. It is not likely that braille will be abandoned as the educational medium for the blind student. There is no remote suggestion intended that this course be taken. There is, however, the charge for professionals to use research skills and technology to study ways of minimizing the disadvantages of braille reading and to explore other media for the education of the visually handicapped.

Listening for Braille Readers

In order to reduce unequal educational opportunity which may exist due to the slow and laborious process of learning and reading braille for some blind children, alternative ways of presenting educational and/or supplementary information must be considered. The auditory channel is considered a major avenue of informational input for persons who are visually handicapped. Consequently, a great deal of recorded material is produced and is available for use by blind persons. The use of these materials may be relatively limited in an educational setting, particularly in the elementary grades where braille reading skill building is emphasized.

Lowenfeld (1945) recommended the increased use of recorded materials as a way of reducing discrepancies in reading rate which exist between braille and print readers. The average rate of spoken discourse is about 175 wpm. Thus, the average braille reader may listen to materials in about half the time it takes to read the same materials. Recorded materials have long been used as a means of presenting supplementary and recreational reading material to blind students, but the teaching of braille skills still enjoy major curriculum emphasis during the elementary years.

With the movement toward improved curricula and educational standards for blind children, there must be a re-evaluation of both the effectiveness and efficiency of modes through which material is presented. A thorough investigation of listening comprehension, listening skill building and comparisons of listening and reading will constitute a beginning.

Reading Versus Listening

The relative effectiveness of reading versus listening for the presentation of educational materials has been of concern to general educators for some time. A review of the literature (Appendix A, Part 2) from 1950 to the present indicates that Brown's conclusions are still applicable.

1. There is tentative evidence that reading becomes a more efficient medium than listening at about the seventh grade.
2. There is tentative evidence that listening ability does not improve after that time.
3. There is tentative evidence that we are less critical when we listen than when we read.
4. There is tentative evidence that difficult material becomes more difficult when listened to than when read.
5. There is tentative evidence that for average and below average students listening is more effective (Brown, 1950).

Research also indicates that listening is more effective than reading for children in the elementary grades. This finding is related to the fact that listening or auditory vocabulary is superior to reading or visual vocabulary during these years (Appendix A, Part 3). For children who are developing sequential reading skills, visual vocabularies grow at a rapid rate and eventually equal and surpass auditory vocabulary (Armstrong, 1953). For the child with limited mental ability, this equality of reading and listening vocabulary may never occur.

Friedman (1959) demonstrated that an oral presentation of material was markedly superior to reading for slow learners. Listening was also superior for educable mentally retarded children when speech was compressed or mechanically speeded up for listening purposes (Robinson, Orr, & Small, 1966). Auditory presentation is not only more effective, but more efficient in terms of the amount of time spent covering the material.

Woodcock and Clark (1968) also demonstrated increased efficiency for low IQ Ss through the presentation of compressed speech, though the sample performed best at rates slower than the most efficient rates for higher IQ Ss. An increase in mental age decreases differences favoring listening (Hampleman, 1955). Increases in CA also decrease the extent to which listening is more effective than reading, but not to the same degree as MA. In Hampleman's study of fourth and sixth grade Ss, length of passage made no difference, but listening superiority was more marked for easy than for hard passages.

Reading Versus Listening in the Blind

Nolan (1966) and Bixler, Foulke, Amster, and Nolan (1961) have demonstrated the relative efficiency of reading by listening over tactual reading in the blind. Listening is at least as effective as braille reading and when speech is compressed, efficiency indexes rise as much as 300 per cent in some cases, without significant loss of comprehension.

In an extensive study of braille reading, in which the individual braille character was established as the perceptual unit in touch reading, Nolan and Kederis (1969) concluded that low intelligence appears to be responsible for increasing the time necessary to integrate sequentially, information for the individual characters. The authors stated

> ...these findings suggest that below certain level of mental ability, braille ceases to be an effective medium for educational communication. The results of the studies reported in this monograph make explicit the greater complexity of the braille reading process as compared to print and suggests its greater difficulty. These facts, in turn, imply that the intellectual cut off point for serious consideration of reading as an educational vehicle may be much higher for braille than for print. Consequently, the strong emphasis placed on development of braille reading skills for almost all blind children, may, for those in the lower ranges of mental ability,

> impose a severe, and in many cases, a fatal educational handicap (p. 47).

It becomes evident that reading medium comparisons are not only pertinent, but essential to the search for possible solutions to the inherent difficulties present in braille reading. Knowledge of media effectiveness is of particular importance to the education of the blind child with low mental ability whose tactual reading skill may never develop into a useful tool for gaining information.

It is generally accepted that a relationship exists between age, intelligence, reading comprehension and sometimes reading rate (Smith & Dechant, 1961, p. 222). Difficulty level of the material is related to comprehension regardless of intellectual level (Sticht, 1968). When additional analyses were performed on partial data collected by Nolan and Kederis (1969, p. 9) these expected relationships did not hold true for braille readers with IQ's below 85 (Appendix B). Braille readers of low intelligence apparently do not conform to expectations related to reading and listening behavior in the sighted. Research is needed to investigate further the relationships among variables relevant to reading and listening in light of curricular emphases and educational media. The present study was designed to investigate the relative effectiveness of braille reading and reading by listening as a means of processing information by blind children of low ability. Individual differences were controlled by using special grouping techniques for Ss rather than grouping according to traditional categories of age, grade level or IQ. Ss were grouped according to their actual level of reading comprehension and reading rate on a test specifically chosen for this purpose.

Statement of Purpose

The present emphasis in the education of the visually handicapped which is placed on braille reading, may well be less appropriate for blind children below a certain level of ability than are other means of gaining information. Not only is the process of learning to read braille laborious and complex, but the end result may not constitute sufficient skill in these children to provide an efficient or effective medium for learning. Recent technological advances for the time compression of speech, as well as deepening concern with teaching methods and curricular content for students of low ability, has renewed interest in the auditory channel as a mode of learning. Basic to any development in this area is a thorough study of the relative effectiveness of tactual and auditory reading. The purpose of this investigation was to study the relative effectiveness of braille reading and reading by listening as modes of informational input for visually handicapped students who fall within the retarded range of measured intelligence. The relative effectiveness of modality has been studied in terms of the existing level of braille reading comprehension of the Ss, their braille reading rates and the difficulty level of the materials read. Inferences were also made relative to subject variables of age and intelligence within the sample as these variables related to reading and listening comprehension of the experimental materials. The study has attempted to provide evidence with which to evaluate increased use of reading by listening for those students who may improve their learning by greater use of this method than by braille reading.

Experimental Expectations

Expectation I. Groups which were formed on the basis of either high or low reading comprehension (C) in combination with fast or slow reading speed (S) were expected to differ with respect to IQ and CA. The degree of difference was expected to be greatest between the groups of Ss with high reading comprehension who read rapidly (C_H-S_F) and the groups with low reading comprehension and slow reading speeds (C_L-S_S).

Expectation II. It was expected that the main effect of mode (M) would be significant. Listening comprehension, regardless of the difficulty level of the material (D) presented, would be superior to braille reading comprehension for all Ss. The superiority of listening over braille reading was expected to be greatest for those Ss whose reading comprehension was low and who also read slowly (C_L-S_S).

Expectation III. Significant differences were expected to result between levels of all three control variables regardless of the mode in which experimental materials were presented. Ss with a high level of reading comprehension on the subject classification test would learn more than would Ss who comprehend at a low level. Differences would exist between Ss classified as fast and slow readers. Comprehension of easy material would be significantly greater than comprehension of hard material.

Expectation IV. A significant interaction was anticipated between the mode in which Ss read materials and the difficulty level of the material that would demonstrate the superiority of listening comprehension over reading comprehension for the more difficult material (M x D).

Expectation V. No significant relationship was expected between reading comprehension and reading speed on the subject classification test. However, when these two variables are considered jointly, each level of one combined with each level of the other, and with mode of reading, a significant interaction was expected (M x C x S).

Summary of Expectations

It was expected that by grouping Ss on the basis of their reading comprehension (C) and reading speed (S) an overall superiority of reading by listening would occur, for materials representing two levels of reading difficulty (D). All main effects were expected to be statistically significant. Significant interaction effects for mode and difficulty level of the material (M x D), and for mode, comprehension level, and reading speed (M x C x S) were expected. Groups formed on the basis of comprehension level and reading speed were expected to differ with respect to both IQ and CA.

The study was so designed as to investigate the factors which might influence the relative effectiveness of braille reading and reading by listening in blind children of low ability. The dependent variable was mode of reading (M) which was measured by the amount learned by reading in braille or listening to recorded materials. A 2 x 2 x 2 x 2 factorial design with repeated measures on a fourth factor, difficulty level of the material (D), was selected to analyze the data obtained in the study. For a more extensive treatment of the design and a graphic representation of its components, see Appendix G. Subject variables of CA and IQ were analyzed by simple analyses of variance and t tests for the

mean comparisons which were pertinent to the interpretation of the data.

Method

Subjects

Random sampling of Ss who are visually handicapped on any selection criteria is difficult if not impossible to accomplish due to several factors.

1. It is not possible to identify all visually handicapped children in the general population.

2. The population which has been identified is widely scattered across the United States.

3. A visual handicap, even within the legal definition of blindness, does not necessarily mean a student must use braille as his educational media.

4. Many visually handicapped students who read braille and who may meet selection criteria, attend day school in local communities and their availability for research purposes is limited due to practical considerations of the time and cost involved in data collection.

5. Often only incomplete or erroneous data which are pertinent to the selection criteria are available.

For these reasons, Ss were drawn from residential schools for the blind which were willing to participate in the study, which had sufficient numbers of students who met selection criteria, and which were geographically accessible. Subject selection criteria were as follows: Children who--

1. were currently enrolled in a residential school for the blind.

2. were below IQ 85 on an individual intelligence test. [These

scores are almost always obtained from either the Interim Hayes-Binet Intelligence Test for Blind Children (1942) or the verbal subtests of the Wechsler Intelligence Scale for Children (1949).]

3. were between the ages of 9-0 and 20-0 years.

4. read braille and had received braille reading instruction for at least three years.

The Illinois Braille and Sight-Saving School, the Indiana School for the Blind, the Ohio School for the Blind, the Missouri School for the Blind, and the Western Pennsylvania School for Blind Children were contacted and asked to submit rosters of their students who met these requirements including the birth date and IQ for each. Table 1 shows the number of students submitted by schools and subsequent numbers involved in the study.

Table 1

Distribution of Ss by State

State	Number who met selection criteria	Number taking Gates Reading Survey	Number taking both experimental tests	Number included in study	Per cent of Total Sample
Illinois	24	19	19	13	16%
Indiana	11	10	10	8	10%
Missouri	24	17	15	15	19%
Ohio	43	38	36	29	36%
Western Pennsylvania	28	16	16	15	19%
Total	130	100	96	80	100%

It was found that from the initial list submitted, some Ss were unable to take the subject classification test (Speed Test of the Gates Reading Survey) due to their absence from school at the time of testing or their inability to read test material.

Of the 100 Ss who took the subject classification test, four were unavailable at the time experimental materials were administered. The 96 remaining Ss were presented with two literary passages with a comprehension test following each. One-half of the sample read the passages in braille and one-half listened to pre-recorded tapes of the same passages. Random assignment to reading modality, tactual or auditory, was made within each of the four groups classified according to reading rate and reading comprehension level (Table 2). These groups consisted of Ss from all five schools. The distribution of Ss by state according to the modality in which they received experimental passages is presented in Table 3.

Table 2
Distribution of Ss by Dichotomized Groups formed on basis of Median Performance Levels of the Speed Test* who received Experimental Passages
N = 96

		Comprehension		
		High	Low	Total
Reading Speed	Fast	n = 23	n = 23	46
	Slow	n = 20	n = 30	50
	Total	43	53	96

* Median Reading Time: 49' 00" (42.5 wpm)
Median Comprehension Score: 54

Table 3
Ss Who Read and Ss Who Listened to Experimental Materials
N = 96

State	Readers	Listeners	Total
Illinois	9	10	19
Indiana	3	7	10
Missouri	8	7	15
Ohio	17	19	36
Western Pennsylvania	11	5	16
Total	48	48	96

The design required 10 Ss per cell or a total of 80 Ss. Those 80 Ss were randomly selected from the pool of 96 who took experimental tests, while taking into account their classification according to comprehension level, reading rate, and the modality in which they read experimental passages.

Materials

Subject Classification Test. The Speed Test of the Gates Reading Survey (1953) was selected to be used for the purpose of classifying Ss according to their reading speed and comprehension level in lieu of forming groups on IQ measures. The Speed Test contains 2,084 words arranged into 64 test items. Each item is a brief paragraph followed by a question with four alternative answers. The information needed to answer each question is contained in the paragraph and does not represent an unrealistic task for blind children.

The Speed Test was edited and prepared in Grade 2, Standard English Braille by the American Printing House for the Blind, Louisville, Kentucky. The format of the original print edition was modified to conform to standards usually followed in the publication of braille, multiple choice tests. Instructions to Ss were devised which were appropriate for administering the test in braille. Instructions were also included for the Examiner (Appendix D).

When the Speed Test is administered to print readers, the specific purpose is to obtain a measure of reading speed. A specific amount of time is allowed, depending upon the grade level of the children being tested. The Ss' scores are the number of items answered correctly within the time limit. In the present study, unlimited time was given to complete the entire test so that comparable comprehension scores could be obtained. The amount of time each S took to complete the test was used to determine the median reading time for the entire sample (49' 00").

Validity and reliability estimates for the Gates Reading Survey, of which the Speed Test is a portion, are considered acceptable by Buros (1965). The fact that these estimates were derived from data obtained from Ss who read the materials in print rather than in braille and that certain adaptations in the administration procedure were made could cast doubt upon the applicability of the test for blind children. However the purpose of using the test was only to discriminate roughly among Ss on a measure of reading comprehension and reading rate for classification purposes. No comparable tests are available which have been standardized for use with blind children. Similar adaptations have

been made for the use of such reading tests as the Stanford Achievement Test with satisfactory results. The test was therefore considered appropriate for obtaining the required information even though it was not standardized for use with blind children and certain procedural adaptations were made.

For testing the feasibility of using this instrument for classification purposes, a pilot study was conducted using 30 braille readers from the Kentucky School for the Blind whose IQ's were below 90. Analysis of results revealed the test had a low ceiling and represented easy reading for a large part of the sample. The negatively skewed distribution of scores was not considered critical in terms of the purposes for which they were used.

Experimental Materials. The experimental materials consisted of two selections from children's library books. The selections were approximately the same number of words in length and were chosen for their interesting and factual content which would allow for the construction of comprehension tests appropriate to each selection. It was necessary that Ss not be familiar with these materials in order to obtain a valid estimate of the amount learned from the single exposure to them during experimental testing. The books from which the passages were chosen have been reproduced in braille, but on a limited production basis and were not considered readily accessible to those students included in the study. In no instance did children report that they had read or heard the stories prior to their presentation for experimental purposes.

Experimental passages were analyzed by readability formulas to objectively determine reading difficulty level.

Difficulty	Title	Length	Grade Level
Easy Passage	"Portugee"	821 words	2
Hard Passage	"French Foreign Legion"	820 words	6

Grade level for the hard passage was determined by both the Flesch (1951) and the Dale-Chall (1948) readability formulas which were in agreement indicating a reading level of grade six. Grade level for the easy passage was determined by the Spache (1953) formula, the downward extension of the Dale-Chall, and classified the passage at grade level two. Appendix A, Part 4 contains a review of the literature which considers the use of readability formulas to determine listenability. Readability formulas may not be an ideal measure of the difficulty level of materials to be presented aurally, but there is no readily available alternative providing objective evaluation. No such analog for listening materials is available. Ashcroft (1960) suggested that readability formulas may underestimate braille reading difficulty. However, there is evidence that listening or auditory vocabulary is superior to reading vocabulary in the elementary grades (Appendix A, Part 2) which may cause an overestimation of difficulty level of listening materials analyzed by readability formulas. The two levels of difficulty which resulted from the present analysis, grade two and grade six, were considered to provide a wide range of reading levels applicable to the Ss taking the tests, even when the possibility of an overestimation of listening difficulty was taken into account.

It was anticipated that many Ss would have difficulty reading the hard passage due to the restricted range of ability represented in the sample. The same passage would then represent an easier comprehension task if presented auditorily. This would be due in part to the difficulties inherent in braille reading. Any pre-existing advantage for listening was not critical to the design of the study, but rather served as additional support for the need to evaluate auditory presentation of materials to blind children of low mental ability.

Multiple choice tests with four alternative answers were developed to measure comprehension on each passage. The tests had accompanying directions and sample items (Appendix F). A split half reliability coefficient, corrected for length by the Spearman-Brown Prophesy Formula (Guilford, 1950) was derived from the test performance of a sample of braille readers from the Tennessee and Kentucky Schools for the Blind for each test. The following coefficients were obtained, which were significantly different from zero beyond the .01 level of confidence.

Test	N	Number of test items	r
"Portugee"	33	51	.89
"French Foreign Legion"	31	45	.82

The tests are considered to be reliable and to have content validity in that they were constructed directly from factual information contained in each passage.

Reading passages and comprehension tests were reproduced in Standard English Braille, Grade 2, by the American Printing House for the Blind.

Print copies of both passages may be found in Appendix F.

Listening passages were recorded at studios at the American Printing House for the Blind at 3-3/4 ips. Passages were recorded by a professional reader who was instructed to read slowly, but only to the extent that expression was not affected to a degree that would be distracting to the Listener. The following represents length of the recorded tapes and reading rates which resulted. The rates are somewhat slower than the normal speaking rate of 175 wpm.

Title	No. of words	Rate (wpm)	Length of Recording
"Portugee"	821	131 wpm	6' 15"
"French Foreign Legion"	820	135 wpm	6' 05"

Procedure

Students who met subject selection criteria in state residential schools for the blind in Indiana, Ohio, Missouri, and Western Pennsylvania were given the Speed Test of the Gates Reading Survey during the first week of December 1968. All schools were tested with experimental materials during a three week period in early 1969, with approximately six weeks intervening between initial testing and experimental testing. It became necessary to include another school, the Illinois Braille and Sight-Saving School, to obtain the required number of Ss. Classification data were gathered during the same period the experimental passages were administered at the Illinois School.

Subject Classification Test. The Speed Test of the Gates Reading Survey was administered to all students of a participating school in a group setting. A standard procedure was followed for each group admini-

stration (Appendix D). Students were required to read braille items independently and mark their responses to multiple choice questions on individual test copies. Median performance levels for reading comprehension rate were determined. Ss were classified according to their performance above or below the median comprehension score of 54, in combination with their reading rate, also above or below the median for the entire sample (49' 00") (Table 2). The sample was fairly evenly distributed within the categories. A tetrachoric correlation coefficient (Edwards, 1967, p. 132) based on the resulting distribution supported the independence of these two variables (r_t = .16; $6r_t$ = .161).

Administration of Experimental Passages. Schedules for administering experimental passages and their associated comprehension tests were arranged in advance with each of the schools involved. Two days were spent in each school so that Ss were tested once on each of two consecutive days following the presentation of the easy passage, "Portugee," or the hard passage, "The French Foreign Legion." The order in which the passages were presented was randomly determined for each S at the time random assignment to modality was made.

Some attention was given to forming groups for reading experimental passages in braille on the basis of the Ss' reading rate on the Speed Test. This grouping procedure was adopted so that Ss in a particular group would complete a session in about the same length of time. The time it took Ss to complete the task was of importance where large groups of Ss were being tested. Groups ranged in size from three to twelve students, depending upon the school.

A standard procedure was used for the presentation of materials and administration of the tests both in listening and reading groups. The instructions varied slightly depending upon the modality in which material was being presented, either braille reading passages or recorded passages. Instructions for the comprehension tests were the same (Appendix E). The Ss were given sample items to assure understanding of how to mark answers. Each was provided with a copy of the test booklet in braille and marked answers directly on it with a pencil. This method is generally accepted for administering braille achievement tests and all children were familiar with the procedure. Instructions for the tests were given just prior to presentation of the passages.

The test was administered immediately following reading of the materials with the examiner reading each item and its four alternative answers aloud, twice, while the Ss read silently in braille. This procedure was used in an attempt to obtain an estimate of actual comprehension of the material presented, rather than a measure of braille reading ability (Appendix E). For the groups who read in braille, Ss were given their tests as they finished reading the passage. When all Ss had finished, the examiner began reading questions from the beginning and those who had been working independently were instructed to check the items they had already completed. Since attention had been given to grouping Ss according to their reading times on the subject classification test, no Ss worked independently for longer than ten minutes.

Results

This section presents the results in terms of the experimental expectations set forth in an earlier section.

Subject Variables

Expectation I. Groups which were formed on the basis of either high or low reading comprehension in combination with fast or slow reading speed were expected to differ with respect to IQ and CA. The degree of difference was expected to be greatest between the groups of Ss with high reading comprehension who read rapidly (C_H-S_F) and the groups with low reading comprehension and slow reading speeds (C_L-S_S).

The overall mean IQ for the entire sample was 75.3. Mean CA was 184.82 months or 15.4 years. Mean ages and mean IQ scores were also determined for each of the groups classified according to the mode in which they read experimental materials. These data and the associated range for each group are presented in Table 4.

Table 4
Mean Ages and Mean IQ's with Associated Ranges for Dichotomized Groups

		Readers		Listeners	
		Comprehension			
		High	Low	High	Low
Reading Speed: Fast	M IQ	79.1	74.1	78.6	75.4
	Range	72-85	60-83	68-84	62-84
	M CA (mos.)	191.2	167.9	187.2	188.9
	Range	160-224	114-198	123-225	142-219
Reading Speed: Slow	M IQ	75.6	70.2	78.8	70.5
	Range	61-84	51-83	69-84	59-82
	M CA (mos.)	178.0	181.1	194.3	190.0
	Range	137-232	125-228	147-233	157-233

An analysis of variance was performed comparing means for CA and IQ between groups formed on the basis of a combination of reading comprehension and reading speed without regard to the mode in which Ss received experimental materials. Table 5 presents these means. Results of the F test are shown in Table 6.

Table 5
Mean CA and Mean IQ for
Dichotomized Groups*

		Comprehension	
		High	Low
Reading Speed	Fast	M IQ = 78.9 M CA = 189.2	M IQ = 74.8 M CA = 178.4
	Slow	M IQ = 77.2 M CA = 186.2	M IQ = 70.4 M CA = 185.5

* n = 20

Table 6
Analysis of Variance for Differences
Between Groups with Respect to
CA and IQ

	Source of Variation	SS	df	MS	F
IQ	Between Groups	820.34	3	273.44	5.32*
	Within Groups	3,906.05	76	51.29	
	Total	4,726.39	79		
CA	Between Groups	1,254.05	3	418.01	5.70*
	Within Groups	55,653.50	76	73.23	
	Total	56,907.55	79		

*P $\geq$ .01

With respect to comprehension level, those Ss who demonstrated a relatively high level of comprehension on the subject classification test also have high IQ's regardless of their reading speed. There is also a tendency for these Ss to be older than those Ss with relatively low levels of reading comprehension though differences are small. No particular pattern of age or intelligence was apparent when reading speed alone is considered (Table 5).

The overall analysis of variance (Table 6) indicated the dichotomized groups differed with respect to both of these variables. As neither age nor intelligence was consistently related to reading speed, reading comprehension level appeared to be the variable which exerted the most influence upon differences among groups. To investigate this relationship, mean differences between each level of reading comprehension and each level of reading speed were tested by t tests. These data are presented in Table 7.

Table 7
Mean CA and IQ Comparisons for Ss
when Grouped according to Reading Speed
or Comprehension Level
N = 80

	Fast Readers n = 40		Slow Readers n = 40	t	High Comprehension n = 40		Low Comprehension n = 40	t
M CA (mos.)	183.8	vs	185.9	.339	187.7	vs	182.0	.942
M IQ	77.2	vs	73.4	2.214*	77.7	vs	72.9	2.898**

* $P < .025$
** $P < .005$

There were no statistically significant differences between Ss with high reading comprehension and those with low reading comprehension with respect to CA. Similarly, no significant difference in age was found between fast and slow readers. Both reading speed and reading comprehension level appeared related to intelligence. Those Ss who read rapidly and those who comprehended at a relatively high level had higher measured IQ's than did slow readers or low comprehending readers. When groups formed on the basis of Ss' performance on these two variables in combination are compared, differences in CA and IQ become apparent as evidenced by the statistically significant F tests for both comparisons over all four groups (Table 6).

Analysis of Experimental Data

Test for Homogeniety of Variance. Cochran's test for homogeniety of variance was made for both between Ss and within Ss variation (Winer, 1962, p. 94). The results of these tests are presented in Table 8.

Table 8
Results of Cochran's Test for
Homogeniety of Variance

Source	C	Alpha Level	DF
Between Ss	.1634	.01	n-1 = 19, k = 8
Within Ss	.1388	.01	n-1 = 9, k = 16

As the variance both between and within Ss was determined to be homogeneous, the overall analysis of variance was performed using raw data in proportional form. There were two scores for each S which represented

the proportion of items answered correctly on each test of comprehension. These data may be found in Appendix H. Criterion data for dichotomized groups are presented in Table 9. The analysis of variance within the 2 x 2 x 2 x 2 factorial design was analyzed by methods described in Winer (1962, Ch. 7). Results are presented in Table 10.

Table 9
Criterion Data
Mean Scores and Standard Deviations
for Dichotomized Groups
on Comprehension Tests*

			Readers		Listeners	
Speed	Comprehension		Easy	Hard	Easy	Hard
Fast	High	M	.675	.546	.607	.395
		SD	.154	.117	.180	.060
	Low	M	.451	.397	.541	.406
		SD	.156	.149	.217	.142
Slow	High	M	.694	.491	.617	.480
		SD	.171	.152	.242	.152
	Low	M	.457	.346	.617	.426
		SD	.188	.098	.205	.124

* Mean Scores = sum of scores in proportions/n

Table 10
Analysis of Variance Using
Raw Data in Proportions

Source of Variation	SS	DF	MS	F
Between Ss	4.145	79		
Mode (M)	.000	1	.000	.000
Speed (S)	.007	1	.007	.149
Comprehension Level (C)	.466	1	.466	9.915**
M x C	.261	1	.261	5.553***
M x S	.047	1	.047	1.000
S x C	.000	1	.000	.000
M x S x C	.001	1	.001	.021
Ss Groups (error between)	3.363	72	.047	
Within Ss	1.821	80	.023	
Difficulty Level (D)	.857	1	.857	71.417*
D x M	.021	1	.021	1.750
D x S	.008	1	.008	.666
D x C	.023	1	.023	1.917
D x M x S	.014	1	.014	1.167
D x S x C	.009	1	.009	.750
D x M x C	.013	1	.013	1.083
D x M x C x S	.012	1	.012	1.000
D x Ss Groups (error within)	.864	72	.012	
Total	5.966	159		

* P $\geq$ .001
** P $>$ .01
*** P $>$ .05

Expectation II. It was expected that the main effect of mode (M) would be significant. Listening comprehension, regardless of the difficulty level of the material presented, would be superior to braille reading comprehension for all Ss. The superiority of listening over braille reading was expected to be greatest for those Ss whose reading comprehension was low and who read slowly.

The main effect of mode of presentation (M) was not statistically significant which suggests that comprehension of materials was not

affected by whether Ss read the materials in braille or listened to them in recorded form when all other factors are taken into account. The expected relationship of mode with reading speed and comprehension level was not found. However, the significant M x C interaction indicated that when reading comprehension level is considered in combination with mode of reading, differences in mode effectiveness occur. The M x C interaction was analyzed by multiple t tests (Edwards, 1966). Means for the comparison were derived from data presented in Table 9. Results of these tests are found in Table 11.

Table 11
Comparison of Group Mean Scores within the
M x C Interaction

		Comprehension			
		High	vs	Low	
Mode	Readers N = 40	M = .6012	-->	M = .4127	4.961*
	vs	vs			
	Listeners N = 40	M = .5247	-->	M = .4975	.604
	t	1.866**		2.12**	

* P < .01
** P < .05

For the Ss who read experimental materials in braille, those with a high level of reading comprehension learned significantly more than those of low reading comprehension (t = 4.961; P < .01). Level of

reading comprehension had no significant effect upon the ability to comprehend material while listening. However, when reading comprehension was compared to listening comprehension of experimental materials for those Ss with a high reading comprehension level, reading was the superior mode ($t = 1.866$; $P < .05$). The reverse was true for Ss with low reading comprehension. Experimental materials were comprehended to a greater degree when listened to than when read by Ss whose level of reading comprehension was determined to be low on the subject classification test ($t = 2.12$; $P < .05$). A graphic representation of this relationship is provided in Figure 1.

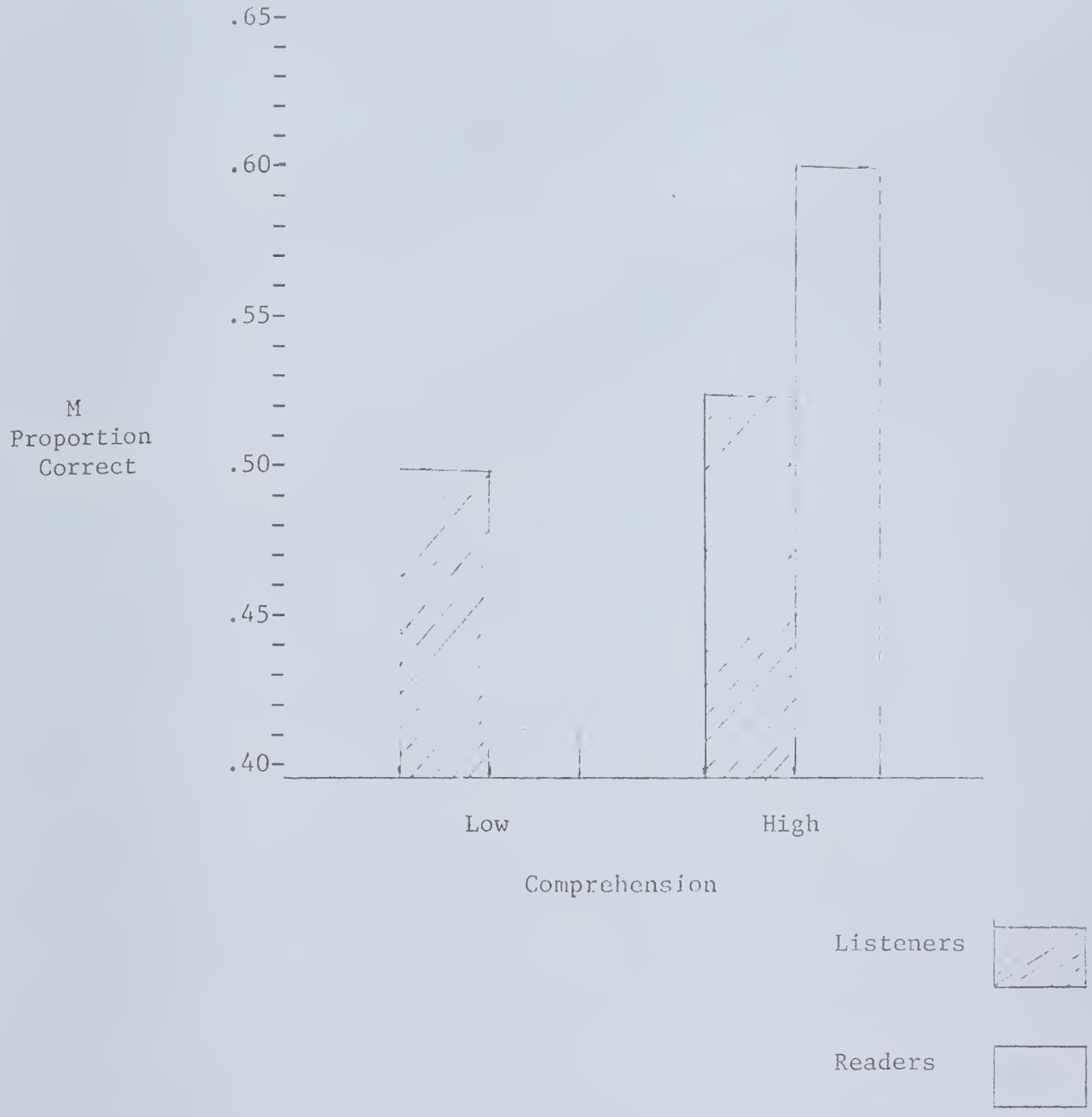

Figure 1. Relative performance of Ss who read and those who listened to experimental materials at two levels of comprehension. Means represent the average performance of all Ss at a particular level of comprehension for both easy and hard materials (n = 20).

Expectation III. Significant differences were expected to result between levels of all three control variables regardless of the mode in which experimental materials were presented. Ss with a high level of reading comprehension on the Speed Test would learn more than would Ss who comprehend at a low level. Differences were expected to exist between Ss classified as fast and slow readers. Comprehension of easy material would be significantly greater than comprehension of hard material.

The significant main effect of Comprehension Level (C) was predicted due to the fact that groups were formed according to the relative performance of Ss, either high or low, on a reading comprehension task. Ss who demonstrated a high level of reading comprehension on the subject classification test, comprehended more when reading or listening to experimental materials than those Ss with a low reading comprehension level.

Difficulty level of materials (D) was also found to be significant according to experimental expectations. The performance of Ss on second grade and sixth grade material differed significantly with sixth grade material representing the more difficult task as evidenced by lower test scores.

Though Ss were divided according to their reading speed above or below median speed on the subject classification test, mean differences for speed, when averaged over all levels of all other factors, were not statistically significant. The non-significant F ratio for the main effect of reading speed (S)--and the fact that reading speed did not interact with any other variable or combination of variables indicates that inter- and intra-subject differences are such that no relationship was evident between braille reading speed and the variables under consideration in this study.

Cross mode comparisons were also made. When high comprehending readers are compared with low comprehending listeners (M_R/C_H vs M_L/C_L) a significant difference is found in favor of those Ss who read materials in braille ($t = 2.529$; $P < .01$). Those Ss who listened to materials and who had a relatively high level of reading comprehension also learned more than Ss who read materials and were of a relatively low level of reading comprehension (M_L/C_H vs M_R/C_L; $t = 2.800$; $P < .01$). The results of these additional comparisons are also an indication of the influence that a pre-existing level of reading comprehension has upon mode of presentation of the materials used in the study.

Expectation IV. There would be a significant interaction between the mode in which Ss read materials and the difficulty level of the materials that would demonstrate the superiority of listening comprehension over reading comprehension for the more difficult material (M x D).

The expected significant interaction of mode and difficulty level of materials (M x D) did not occur. More was learned from the easy passage than from the hard passage by all Ss, regardless of the mode of presentation. This is evident from the data in Table 9 which presents mean scores in proportions and the standard deviations for the dichotomized groups according to mode and difficulty levels. When reading speed and comprehension level are disregarded, both readers and listeners are able to answer about 57 per cent of the questions on the test over the easy passage. Similarly, about 44 per cent of the questions are answered correctly on the test over the hard passage for both reading and listening groups. Differentiation between readers and listeners according to the amount learned on either passage only becomes

apparent when level of reading comprehension is considered. As has been stated in the previous section relative to Expectation III, Ss with a high level of reading comprehension learned more when reading materials than when listening. Ss with low reading comprehension learn more by listening. This relationship held true for passages at both levels of difficulty with greater learning always occurring for the easy passage.

Expectation V. No significant relationship was expected between reading comprehension and reading speed on the subject classification test. However, when these two variables are considered jointly, each level of one combined with each level of the other, and with mode of reading, a significant interaction was expected (M x C x S).

As had been expected, level of reading comprehension and reading speed were not related. A tetra-choric correlation for groups formed on these two variables in combination was also non-significant (r_t = .16; σr_t = .161) indicating a low and non-significant relationship within the sample. These data were obtained for the subject classification procedure described in Appendix G. The expected M x C x S interaction was not confirmed.

Reading Rates Obtained on Experimental Materials

The exact time required to read each of the experimental passages in braille was recorded for the 40 Ss who presented materials in this manner. The mean reading time and the range of times required for reading are reported for each of the four dichotomized groups in Table 12. Mean reading rates were determined on the basis of mean reading time and length of passage for both selections (Table 12).

Table 12
Mean Reading Times in minutes and Number Words per Minute (wpm) for Ss Reading Experimental Passages in Braille
n = 40

		Comprehension			
		High		Low	
		Portugee*	FFL**	Portugee*	FFL**
Reading Speed	Fast	M = 6.97 Range = 5.58-9.72 M wpm = 118	M = 7.06 Range = 5.58-10.63 M wpm = 116	M = 10.55 Range = 7.08-13.17 M wpm = 77	M = 10.08 Range = 5.58-19.58 M wpm = 81
	Slow	M = 9.50 Range = 6.57-12.98 M wpm = 86	M = 10.75 Range = 4.67-14.23 M wpm = 76	M = 12.51 Range = 6.17-20.05 M wpm = 66	M = 15.87 Range = 8.97-22.07 M wpm = 52

* 821 words contained in Portugee passage
** 820 words contained in French Foreign Legion passage

The time required for listening by the 40 Ss who were presented materials in recorded form remained constant at slightly more than six minutes for each selection. For these Ss, reading by listening resulted in rates of 131 wpm for the easy passage and 135 wpm for the hard passage.

Discussion

Subject Variables

Intelligence. Groups of Ss with relatively high reading comprehension as defined for purposes of the study, have significantly higher mean IQ's than do those Ss with relatively low comprehension (78.1 vs 74.6). As the two groups were formed on the basis of a performance level above or below the median on a test of reading comprehension, it is possible that these differences would be demonstrated to an even greater extent if high and low comprehension had been more widely separated or more strictly delineated. The relationship demonstrated between comprehension and intelligence for print readers appears to also be true for braille readers in this study. The relationship between reading speed and IQ was not so apparent though there was a tendency for fast readers to have higher mean IQ's (76.8 vs 73.8). The differences in IQ as related to reading speed become most apparent when comprehension is taken into account. Fast readers who also have relatively high levels of comprehension have significantly higher IQ's than do slow readers who have a relatively low level of comprehension (78.9 vs 70.4). It should be recalled that the IQ data were obtained from earlier records and from the Hayes-Binet and WISC verbal scales.

Chronological Age. The older Ss studied had a tendency to comprehend materials at a higher level regardless of their reading speed. The mean age for fast and slow braille readers who had relatively high levels of comprehension was 189.2 and 186.2 months respectively. For Ss with a relatively low level of comprehension, those who read rapidly, as defined

in this study, were somewhat younger than any other group (178.4 months). This may indicate that when reading skills are not well developed, Ss tend to cover material rapidly with very little understanding of what is being read. Ss who read slowly and also have a low level of comprehension are at about the same age as Ss with higher levels of comprehension (185.5 months), but their IQ's were significantly lower than any other group. It should be noted here that the limitations placed on IQ for the sample influenced the fact that Ss were generally overage for grade placement or were in ungraded classes for slow learners.

Analysis of Experimental Data

Main Effects. Significant differences were not obtained between levels of the factor mode (M) when all other factors were taken into account. Neither reading in braille nor reading by listening proved to be superior for learning by Ss in this study with the particular reading characteristics described and when reading materials representing two difficulty levels were presented. The effects of mode did become apparent when level of reading comprehension alone was taken into account. The significant M x C interaction will be discussed in the section on interaction effects.

Significant differences did occur between the levels of the control variable, level of braille reading comprehension (C) when averaged across all other variables. Classifying Ss according to their performance above or below the median comprehension score on the Speed Test of the Gates Reading Survey revealed similar differences in learning as evidenced by comprehension test scores over the experimental materials.

The control variable of reading speed was not statistically significant. There was apparently no consistent relationship between Ss' reading speed on the subject classification test and performance on experimental materials when all other variables were taken into account. Reading rates generally vary with the nature of the reading task. The fact that no relationship existed between reading speed and other variables included in the study may be a function of the measure used in this study.

Sixth grade reading materials presented a consistently more difficult comprehension task than did second grade materials regardless of the mode in which they were presented. The difference was evidenced by the significant main effect of (D). The fact that all Ss were only able to answer an average of 44 per cent of the test questions correctly for the hard passage and an average of 57 per cent on the easy passage indicates that the overall level of comprehension for the Ss studied is somewhat low. The restrictions placed on measured intelligence for the sample would likewise restrict comprehension level.

Interaction Effects. The significant M x C interaction indicates that braille readers of low mental ability in this study learned differentially in one mode or another depending upon their level of braille reading comprehension. Ss with a high level of comprehension on the subject classification test learned more when reading experimental materials in braille. When reading comprehension was low, listening was the more effective mode of learning. It had been expected that listening would prove more effective for all Ss. Apparently those Ss whose

reading skills are relatively well developed can profit by the referability available to them in the tactual display. Words and phrases can be re-read for clarification and the reader can adjust his reading rate for comprehension. Auditory stimuli, in this case recorded material, cannot be re-read at the convenience of the listener and are susceptible to disruption. Even momentary loss of attention when listening to a passage can cause considerable loss of comprehension. On the other hand, slow, inaccurate reading skills can also reduce comprehension to such a degree that the advantage of a tactual display is affected.

For Ss who demonstrated low braille reading comprehension, irrespective of the cause, listening to connected discourse represented an easier task in that higher levels of comprehension were obtained and in less time than did reading in braille. The effects of the pre-existing level of braille reading comprehension on reading speed can also be demonstrated by comparing the reading groups at two levels of comprehension (Table 12). Low comprehending readers took an average of twice as long to read the materials as high comprehending readers. A second meaningful comparison is across modes within the classification of low braille reading comprehension. The standard listening time for recorded tapes of slightly more than six minutes is about one-third of the average time it took those Ss within the same classification to read materials in braille. With only a few exceptions, listening to materials was more efficient than reading them in braille even though the wpm rate for recorded materials (131 & 135 wpm) was less than normal speaking rate of 175 wpm.

However, the relative effectiveness of mode is the primary issue. The effectiveness of mode in terms of the amount learned was found to be highly related to the level of braille reading comprehension demonstrated on the subject classification test given prior to the presentation of experimental materials.

Reading Rates

The reading rates reported in Table 12 are considerably higher than would be expected for braille readers of low mental ability. Ss with low comprehension and fast reading speeds (C_H-S_S) and Ss with high comprehension and slow reading speeds (C_H-S_S) obtained rates similar to those reported for braille readers in high school within the normal range of intelligence (Appendix A, Part 1). Mean reading speeds of somewhat better than 100 wpm for Ss with high comprehension and fast reading speeds (C_H-S_F) are particularly incongruous with expectations based on a review of the literature on braille reading rates. The group with low comprehension and slow reading speeds (C_L-S_S) was the only group which obtained mean reading speeds which conform to rate expectations for Ss with low mental ability. The within cell rates reflect extreme variability of reading rate among Ss within each group and offer a partial explanation for the high rates obtained.

There are several other factors to consider when interpreting the high reading rates which occurred in three out of four groups. The reading rates reported for this study were calculated on the actual number of minutes it took to read the number of words in the passages. Comprehension of the material was not taken into account in the determi-

nation of rate. Smith and Dechant (1961, p. 222) state that "...rate has no meaning apart from comprehension." Closer inspection of the obtained reading rates relative to comprehension seemed necessary for the purpose of clarifying results.

When mean scores of the proportion of the materials learned on passages by Ss who read them in braille (M_R) are considered separately from Ss who listened, comparisons may be made for each passage at two levels of comprehension (Table 9). Ss with a high reading comprehension level (C_H), regardless of their reading speed, learn approximately the same amount of material (M = .675; M = .694) when reading the easy passage ("Portugee"). Again disregarding reading speed, Ss with a high reading comprehension level learn approximately the same amount when reading hard material ("French Foreign Legion"), (M = .546; M = .491). Ss with low reading comprehension (C_L) regardless of their reading speed answered less than half of the test items correctly for the easy material (M = .451; M = .457) and even less for the hard passage (M = .397; M = .346). As there is little difference in the amount of material learned, regardless of how long it took to read it, the obtained reading rates must be interpreted with caution.

A further note relative to speed and comprehension is pertinent. Higher mean proportion scores were obtained on the second grade passage than on the sixth grade passage for all Ss, indicating the second grade passage was the easier reading task as had been predicted. Not only was "Portugee" easier reading due to its grade level, the passage contained dialogue and was of high interest value which may have enhanced

comprehension and the amount of time required for reading. It took longer for all groups to read the harder, sixth grade passage with the exception of Ss classified as low comprehenders-fast readers (C_L-S_F). This group obtained a reading rate of 81 wpm for the hard passage (Table 12), but demonstrated less than 40 per cent comprehension of the material (Table 9). As was suggested by Smith and Dechant (1961), reading rates obtained without regard to comprehension of the materials being read have little meaning. The relationship between rate and comprehension in this study warrant careful consideration when interpreting the obtained braille reading rates.

Conclusions

Braille reading for visually handicapped students of low ability is generally considered to be characterized by relatively low comprehension of the material and slow reading rates. When Ss are grouped as they were in this study according to their performance either above or below the median comprehension score of 54, and the reading speed of 42 wpm on the Speed Test, several findings become evident. Ss who read rapidly and have a high level of reading comprehension are older (CA = 189.2 mos.) and have higher IQ's (78.9) than do Ss with slow reading speeds and a low level of reading comprehension (CA = 185.5; IQ = 70.4). The ages of these two groups are not critically different, but intelligence does appear to be the factor which differentiates groups on reading speed and comprehension level for the sample. The youngest group in the sample (CA = 178.4 mos.) was made up of those Ss who read rapidly, but with a low level of comprehension of the selec-

ted material. The mean IQ for this group was also somewhat lower than the groups who demonstrated a relatively high level of comprehension on the subject classification test (78.8). Reading speeds for the Ss in this sample were highly variable and revealed no clear relationship with other variables studied. However, there was a tendency for older brighter Ss whose reading comprehension was at a relatively high level also to read more rapidly. It may therefore be concluded that age and intelligence did influence the braille reading skills of this particular group of blind children. Ss who were older and brighter had a decided advantage over their younger, less intelligent counterparts in that they were able to read faster and comprehend more.

When considering the relative effectiveness of braille reading and reading by listening it was found that for this sample the variable which influenced the superiority of one mode of presentation over the other was the pre-existing level of braille reading comprehension. For Ss who read braille with a relatively high level of comprehension as defined by the study, reading was the more effective mode. Ss whose reading comprehension was at a relatively low level learned more when listening to the same materials. It should be noted that generalization of this finding to materials other than were used in this study is not possible. However, the materials used represented literary materials such as are used for supplementary and instructional reading in the elementary grades.

It seems apparent that educators must critically evaluate the braille reading skills of blind students of low ability to determine how

adequate these skills are in providing an avenue for information. For some students learning potential may not be fully realized by presenting educational material solely in a reading mode which is less effective for comprehension and inefficient in terms of the time required for reading. Results of this investigation support the efficacy of auditory presentation of reading materials such as were used in the study. The time taken to listen to materials as opposed to reading them in braille would alone justify an auditory presentation if comprehension remained equal. Not only was more learned from listening by Ss in this study whose reading comprehension was at a low level, more was learned in about one-third the time required to read the same materials.

Braille reading and writing skills provide an independent form of communication for the blind student. These skills represent a necessary tool in the educational setting, but they may be less important to effective living than would be other kinds of general information after the school years. If disproportionate amounts of time are spent in learning braille or using it as the major avenue for information, blind persons of low mental ability may be denied much useful information. Increased utilization of the auditory mode with students for whom it is more effective and efficient than braille reading may well enhance the educational experience for this segment of the blind population.

Implications for Further Research

In order to refine the body of knowledge relevant to the reading and listening behavior of blind children of limited mental ability, further research is indicated. As comprehension level of braille

reading appeared to be a variable which bore a significant relationship to the effectiveness of one mode over the other for this sample of students, the following areas of inquiry are pertinent to the further investigation of the nature of learning by listening or by braille reading.

1. Further study is needed to refine the relationship between mode of reading and comprehension of the materials read in terms of the reading characteristics of the reader. Ss in this study were only roughly discriminated in terms of operationally defined levels of performance on reading characteristics.

2. Measures of comprehension of materials read in braille need to be developed and standardized as a means of determining expected levels of performance relative to age and mental ability.

3. The effects of reading speed for low IQ braille readers as it relates to comprehension of the materials should be investigated further. Though no significant relationship between speed and comprehension was evident in this study, it is possible that a more detailed study using larger numbers of Ss would reveal important relationships.

4. The effects of the particular kind of material read upon comprehension at various levels of difficulty should be studied. Only literary materials were used in this study which represented relatively easy reading for many Ss at both second and sixth grade level of difficulty.

5. The effects of the complexity of the braille code which may increase reading difficulty for tactual readers should be researched

as suggested by Ashcroft (1960).

6. Tactual perceptual processes as they relate to braille reading require further research such as was done in the study by Nolan and Kederis (1969).

A continuing effort must be made to apply research findings to the on going instructional program taking individual differences into account. The following areas of study are also pertinent in view of the recommendation that listening skill development and auditory presentation of material should be a major aspect of the curriculum of low IQ students with low braille reading comprehension.

1. Further study should be undertaken concerning the extent to which reading as compared to listening is a useful educational tool for blind students of limited intellectual ability, including an evaluation of curricular content and the skills necessary for learning pertinent material.

2. An evaluation of materials should be made, both in braille and in recorded form which are already available for students of low mental ability with subsequent recommendations for materials development and the medium in which they should be reproduced.

3. The effects of motivational variables upon both the reading and listening behavior of students of low mental ability should be examined.

4. The extent to which active participation in the listening task enhances learning for low IQ students also warrants research.

5. Ways of developing listening skills in the slow learner in-

cluding comparisons of training methods and procedures urgently requires controlled study.

Other Areas of Research Suggested by the Study

1. Tests of intelligence for blind children still provide only rough estimates of scholastic aptitude. There may be a tendency for present instruments to underestimate the educational potential for blind children of lower ability. Improved instruments are badly needed; not only for obtaining estimates of intelligence but for use in evaluating specific areas within the various educational tasks, e.g. braille reading.

2. The research which has been done on the effects of sensory deprivation upon learning is often inconclusive and conflicting. Further inquiry into this area is needed in addition to test development.

3. Comparisons of listening and reading comprehension have been of interest to general educators for more than thirty years. Still no successful attempt has been made to develop a formula for determining listenability. Readability formulas are still in use for determining difficulty level of materials for listening. There is a need for research to develop normative data relative to listening vocabulary and other factors which influence listening so that a formula for listenability of materials can be devised.

4. It is generally accepted that the process of comprehending materials which are presented auditorily is different from reading comprehension due to the basic differences in perceptual modality. The skills involved in listening must be identified before truly adequate mode

comparisons can be made, and especially before attempts are made to train for the development of listening ability.

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APPENDIXES

APPENDIX A

Review of the Literature

Part 1. Braille Reading Rates
Part 2. Reading vs Listening
Part 3. Reading vs Listening Vocabularies
Part 4. Use of Readability Formulas to Determine Listening Difficulty

Part I

Review of the Literature on Braille Reading Rates

Reading Rates Using Uncontracted and Moderately Contracted Braille

As early as 1918, the attention of educators was being directed toward the extremely slow reading rates of braille readers. S. P. Hayes (1920) reported rates of 30 wpm (words per minute) for students in grade one and 83 wpm for grade nine using uncontracted braille (Grade 1). He was among the first to raise the question of whether or not we are justified in "...requiring blind pupils to undertake the difficult and tedious process of learning to read with the fingers if we cannot bring their average reading rate above 60 wpm? How many graduates will continue reading if they must read so slowly (p. 14)?" During the 1940's reading rates ranging from 53 to 65.5 wpm in grades four through eight were reported by Athearn, Campbell and Lavos (1944), Niday (1939), and Lowenfeld (1945). These rates were obtained by students reading moderately contracted braille (Grade 1-1/2).

Reading Rates Using Fully Contracted Braille (Grade 2)

Lowenfeld (1945) reported the following median reading rates obtained from an efficiency study of the talking book as a supplementary means of presenting educational materials to blind children.

Grade	Median Reading Rate
3	51 wpm
4	58 wpm
6	59 wpm
7	62 wpm

The above median rates were obtained by recording the amount read

during a given period of time. The rates do not reflect comprehension of the material but were reported to demonstrate the inefficiency of reading as compared to listening. When comprehension of materials either read in braille or listened to on the talking book was compared, it was found that listening resulted in superior comprehension of the material for children in the third and fourth grades. The difference in favor of listening was even greater for those Ss whose IQ's were below 90. The reverse was true for Ss in the sixth and seventh grades in that more was learned when reading braille than when listening. The differences in favor of reading were slight for the older group and were explained by the fact that (a) readers adjust their speed to suit comprehension (b) re-reading is possible with a braille copy, which is not possible with the talking book. Lowenfeld suggested that the "...advantages inherent in braille reading weigh more for the less intelligent pupil than for those with higher IQ's, who are able to comprehend well either by braille or by talking book within the given range of speed and without repetition (p. 31)." It is doubtful that the slight advantage of braille reading for older students of low average mental ability is educationally significant in view of the amount of time required for exposure to the material. As talking books are recorded at approximately 175 wpm, it took the Ss in Lowenfeld's study about three times as long to read the same materials in braille.

Meyers and Ethington (1956) obtained reading rates for 275 Ss in the fifth through the twelfth grades and 167 adults in a study of braille spacing. All Ss read material for 30 minutes which had been

determined to be at fifth grade level by the Flesch formula (1951). The overall mean reading rate for school children was 68 wpm. Nolan and Kederis (1969, p. 8) further analyzed these data and found that Ss in grades five through eight read at 63 wpm. Ss in grades nine through twelve read at 86 wpm; adults read at 90 wpm.

As part of a large reading study (Nolan and Kederis, 1969, p. 9), reading rates were obtained for 321 Ss on a portion of the Gates Basic Reading Test. Ss in grades three through eight read at 62 wpm and those in grades nine through twelve read at 72 wpm. Rate and comprehension data for those Ss in the sample whose IQ's were below 85 (n = 95) are reported in Appendix C. Mean reading rates for braille readers in the elementary and high school grades were 39 and 40 wpm, respectively.

The highest braille reading rates recently reported (Lowenfeld & Abel, 1967) are found in a study comparing fourth and eighth grade pupils in residential and day school programs for the visually handicapped. In the fourth grade, day school pupils read at 84 wpm; residential school pupils, 72 wpm. The discrepancy in favor of day school pupils is even larger at the eighth grade level (149 vs 116 wpm). The superiority of day school pupils may be due, in part, to selection factors which exist in the placement of children in educational programs. The rather high reading rates, as compared to those previously reported, may be due to the fact that Ss were only required to read material in braille for one minute and no test of comprehension was given over the material (Nolan & Ashcroft, 1969, p. 63).

Reading Rates Reported Incidental to Studies of Compressed Speech, Grade 2 Braille

Foulke, Amster, Nolan, and Bixler (1962) presented literary and science materials, 2,100 words in length, to 291 Ss in grades six through eight, at several levels of compression. Incidental to this study of compressed speech, reading rates were recorded for 21 Ss. A rate of 70 wpm was obtained for literary material while science material was read at 57 wpm. This finding is consonant with the fact that content of the reading material affects reading speed. The major finding of this study was that Ss were able to listen to literary material which had been compressed to 225 wpm and to science material which had been compressed to 275 wpm, without significant loss of comprehension.

Nolan (1966) reported braille reading rates of 52-57 wpm for 208 Ss in grades four through six. One hundred seventy-four Ss in grades nine through twelve read between 66 and 74 wpm. Passages were 2,100 words long and presented material in science, literature, and social studies at three levels of compression. This study was a comparison of reading and listening comprehension within the three subject areas and demonstrated the superiority of listening in terms of efficiency. In terms of the amount learned in relation to time spent, listening was always at least 100 per cent more efficient than reading in braille. Per cent efficiency varied however, according to the kind of material being read.

Summary

It would appear that fully contracted braille (Grade 2) which shortens the amount of space required to reproduce print in braille

would also tend to decrease the amount of time spent in reading. The research reported above on reading rates using uncontracted, moderately contracted and fully contracted braille does not support this notion. Ashcroft (1960) suggested that space saving efforts such as certain contracted forms may only serve to confuse the braille reader and increase reading errors. This may be particularly true for "multiple-cell contractions, short form words, and lower cell contractions (which) seem to cause special difficulties for children reading in braille (p. 87)." An increase in braille reading errors would tend to decrease reading speeds. Therefore, any increase in reading rates anticipated from the change from moderately contracted braille to the fully contracted code does not become apparent. It has been demonstrated that by eliminating 63 of the least common contracted forms in Grade 2 braille, the length of written material would be increased less than 1 per cent (Nolan & Kederis, 1969, p. 52). Such an increase would not significantly affect passage length or reading speed per se, but the elimination of little used contractions might serve, as Ashcroft suggests, to reduce errors and increase reading rate. This is a researchable question.

From the review of the literature, the following points may be made relative to braille reading rates. Braille reading rates are extremely slow when compared to print reading. Braille readers in the elementary grades read at an average speed of about 60 wpm. Braille readers in high school read at about 75 wpm. Median rates for print readers in the same grades are between 155 and 206 wpm and between 215 and 251 wpm, respectively (Harris, 1961, p. 508).

Only very small increments in rate are found between groups of elementary, high school or adult braille readers. Mastery of the code alone does not allow for increases in rate over time.

Contracted braille has contributed little toward increasing reading rates. This is probably due to the basic perceptual task involved in tactual reading.

The reading rates which have been reported that include measures of comprehension over the material read are probably the most meaningful.

Normal speaking rate is approximately 175 wpm. Material presented orally or recorded at this rate may be listened to in one half to one third the time it takes to read the same material in braille. Visually handicapped students are able to listen to speech which has been compressed or mechanically speeded up to about 225 wpm without significant loss of comprehension.

In view of the above findings a thorough investigation of the effectiveness and efficiency of reading modality is not only pertinent but essential to improved educational practices for visually impaired children.

Part 2

Review of the Literature on Reading vs Listening

When comparing the relative effectiveness of a visual presentation (reading) of material to oral presentation (listening), research findings fall into three categories. These are (a) those that favor reading, (b) those that favor listening, (c) those in which no differences are found between either mode of presentation.

The criterion for a judgment of superiority of one mode over another is usually some measure of comprehension determined by written, sometimes standardized, paper and pencil test. Hartman (1961) pointed out that testing in one sensory channel for information received in another may not adequately measure the amount learned. This must be considered when evaluating research on listening comprehension, even though the practice of administering pencil and paper type tests to measure amount learned from material presented verbally, pictorially, and in written form is generally accepted in the schools. This fact and other inadequacies in research design may account for contradictory and inconclusive results.

Research Findings Favoring Reading as an Informational Input Modality

McDonald (1957) found little difference in recall of material read or heard in fourth grade pupils, where fifth and sixth grade students showed superior recall for material read. Both presentations were tested by means of an oral-recall test. Smith (1959) studied reading, listening and simultaneous reading and listening. More was learned by all Ss when materials were read and listened to at the same time. However,

superior comprehension of materials presented simultaneously was not statistically superior to reading alone. When Ss were grouped according to IQ and reading ability, those Ss with high IQ's and high reading levels learned more from a simultaneous presentation than when listening, but reading alone still remained the most effective modality. The remedial group, those Ss with low IQ's and low reading ability, performed best when presentation was combined. There were no differences for this group between reading or listening alone.

Many (1953) demonstrated the superiority of a visual presentation over an oral presentation using the Pratt Test (1953) with sixth graders. A study by Caughran (1953) using three methods of presentation including visual, oral, and a combination of the visual and oral modes, showed that the combination was superior to visual or oral separately for all Ss. Reading was superior to listening and the combined presentation for children above an MA of 13 (approximately eighth grade level). The reverse was true for those below an MA of 13-0; listening was superior to the combined presentation or reading alone.

There are a number of studies which have demonstrated the superiority of reading over listening for college students. General findings are summarized in a review by Day and Beach (1950). "The greater the intellectual level of the receiver, the greater is the relative advantage of a visual presentation (p. 402)." Greene (1928) found that college students who scored in the upper quartile of a reading test, retained more information when reading, whereas for readers in the lower quartile, superior retention resulted when the lecture method was em-

ployed. There was little difference for those Ss in the two middle quartiles. Corey (1934) found a tendency for those college students who scored in the upper quartile on psychological tests to do relatively better on tests of reading material than on lecture material. More recently, Plessas (1963) demonstrated that better listeners, as measured by the California Auding Test, were also better readers. Several correlations of listening and other aspects of reading ability were reported.

Research Findings Favoring Listening as an Information Input Modality

Miller (1941) found that hearing comprehension was superior to reading comprehension in grades three and four, especially in vocabulary, using the Durrell-Sullivan Reading Capacity Test. Differences were less in the fourth grade. Hanna and Liberati (1952) also found listening superior to reading for fourth graders when comprehension was measured by multiple choice tests. Written recall tests also showed listening superiority but not to the same extent. In a companion study by Kelley (1952) the same results were demonstrated for sixth graders but no statistically significant difference was found between modes for seventh grade children. In a very early study, Young (1936) found that fourth, fifth, and sixth grade children comprehended passages read to them better than those read by themselves. Hampleman (1955) obtained similar results with fourth and sixth graders. The difference was more marked with easy materials than with difficult ones; length of passage had no effect.

Studies Finding no Difference Between Modality

Though McDonald (1957) found reading superior for fifth and sixth

graders, there were no differences in the amount recalled from reading or listening by fourth graders. Spender found no mode superiority in his study using sixth grade Ss. In Smith's (1959) study of single and double mode presentation it was found that low IQ Ss in the sixth grade did not demonstrate differences in the amount learned relative to the mode in which material was presented. For Ss of average or above average ability, both reading alone and simultaneous reading and listening were superior to listening to materials. Kelley's (1952) study has already been cited in support of listening for learning with sixth grade Ss. However, when seventh grade Ss were similarly compared, no differences were found in the effectiveness of reading and listening. Also using seventh grade Ss, Utigard (1962) found no difference in comprehension of stories read independently or listened to on pre-recorded tape. Harwood (1950) presented passages for reading or listening to tenth grade students which represented various levels of difficulty as determined by the Dale-Chall formula (1948). Intelligibility of passages, the dependent variable, was measured by comprehension of the material. Only small differences in intelligibility were found between Ss who read the passages and those who received an oral presentation.

Reading Mode as a Function of Intellectual Ability

An increase in mental age, and to a lesser extent, chronological age, decreased differences between the mode of presentation for fourth and sixth grade Ss (Hampleman, 1955). An oral presentation was superior to visual for fifth grade Ss, especially for those children who were slow learners (Friedman, 1959). In teaching eighth grade literature,

Benoit (1963) found that below about eighth grade reading level (MA = 13-0) listening is more effective than reading. deHoop (1965) concluded from his review of the literature, "...listening comprehension is superior for younger Ss and for lower IQ groups (p. 233)." The findings reported in this section are consistent with the results of studies thus far reported (Smith, 1959; Caughran, 1953; Greene, 1928).

Reading Mode and Difficulty Level of Material

As a part of a study which used 96 army inductees as Ss, (Stitcht, 1968) no statistically significant difference was found between reading and listening behavior of low IQ Ss (70-90) and average IQ Ss (91-106). Material was presented at two levels of difficulty, grade 6.5 and grade 7.5. There was an overall decrease in performance as the material got harder and a trend toward higher listening scores was evident when material shifted from sixth to seventh grade level. The trend was more marked for the low IQ group. For all Ss, comprehension of the two passages was equal when they were listened to but not when they were read. Stitcht suggested that even small increments at critical levels of difficulty would show listening superior to reading for Ss of average and below average intelligence. Richard (1956) was also able to show differences between reading and listening only when passages were difficult. Listening was then more effective for fourth through eighth grade Ss.

Reading Mode and Social Class Membership

In a survey by Lazarsfeld (1940) it was found that poor readers of low cultural levels preferred listening for information to reading. It

is suggested that reading may be so demanding that very little effort can be concentrated on meaning. Children from higher cultural levels who have higher reading ability show a preference for reading. Though membership in a high socio-economic-cultural class does not guarantee superior reading level, there is the greater probability of its existence within this group of children. Hall (1954) reported a correlation of .36 between ability to comprehend spoken language and the ranking of the occupational backgrounds of the pupil's parents. Haggard (1945) demonstrated that lower class children performed better on intelligence tests when items were read to them. However, there is insufficient research evidence to support the assumption that lower class children have consistently greater auding skill than they have reading skill. It is more likely that children who are slow to comprehend written language are also slow to comprehend oral language (Smith, 1966). Deutsch (1965) also suggests that there is a general language deficit for lower class children which would affect learning by either reading or listening.

Reading versus Listening in the Blind

In a progress report of research at the American Printing House for the Blind (Nolan, 1966), the following conclusions were made from a series of eight studies pertaining to reading and listening in learning for the blind.

(a) When all factors are taken into account, listening appears at least the equal of reading in learning materials when presented under conditions of the experiments. Although absolute results at the high school level favored reading in two subject areas, (science and social studies) the time differentials required for learning using the two modes appear to tip the balance in favor of listening. These

findings apply equally to large type and braille readers.

(b) Blind students' listening ability may be slightly superior to sighted students' as measured by the STEP Listening Test. Generally speaking, the same types of relationships among measures of listening, academic achievement, IQ, and personal adjustment characterize the blind as they characterize the sighted.

Hartlage (1963) compared fifty blind and fifty sighted high school students according to their performance on an adapted form of the Otis Gamma Tests of Mental Ability. There were no significant differences between the blind and the sighted when tested for comprehension over a prepared listening passage, though there was a tendency for blind Ss to make higher scores.

Summary, Reading vs Listening

1. Reading and listening are highly related abilities (Plessas, 1963).

2. Listening appears to be the more effective modality for processing information during the elementary years, before reading skills are fully developed (Miller, 1941; Hannah & Liberati, 1952; Young, 1936; Hampleman, 1955).

3. Reading is the more effective modality from about seventh grade on (Smith, 1959; Caughran, 1958; Many, 1953).

4. Presentation of material both visually and orally, may be superior to either mode separately for below MA 13-0 (Smith, 1959; deHoop, 1965).

5. Intelligence is related to the relative effectiveness of reading and listening, listening being superior for students of below aver-

age mental ability (Day & Beach, 1950; Benoit, 1963; delloop, 1965).

6. Achievement level is related to the effectiveness of reading and listening (Friedman, 1959; Benoit, 1963; Greene, 1928).

7. Children who are slow to comprehend written language are also slow to comprehend oral language (Smith, 1966).

8. There is some evidence that socio-economic class influences preference for one mode over the other, as well its effectiveness (Lazarsfeld, 1940).

9. Listening is a more effective channel than reading when information presented is simple and easily understood, and for illiterates and children (Caughran, 1953).

10. Reading shows increasing advantages over listening for older literate Ss, roughly proportional to the increasing difficulty in comprehension of the material (Stitcht, 1968).

11. There is no appreciable superiority of the listening ability of the blind over that of the sighted (Nolan, 1966; Hartlage, 1963).

12. Listening is at least as effective as reading for blind Ss and when the time spent per amount learned is taken into account, it is far superior to braille reading (Nolan, 1966).

Part 3

Reading vs Listening Vocabularies

Children learn to talk without the benefit of systematic instruction (Boney, 1939). This is probably due to factors of self motivation and maturity. Consequently, auditory or listening vocabulary begins to grow quite early in life and the degree of mastery is of no particular concern unless a severe communication disorder becomes apparent. Advocates of the naturalistic evolvement of reading feel that when there is an opportunity for reading and a social demand for it, "...children should learn to read just as inevitably as they learned to talk, so long as the same patience is exercised and the same opportunity for individual growth is granted (Boney, 1939)." Anderson and Dearborn (1952) also feel that, "The process (reading) seems to occur with equal ease among others if the teacher and the parents are willing to relax, wait, and let nature take its course (p. 71)." Current educational practices are an indication that we are quite unwilling to leave the development of vocabulary and reading skills to such chance occurrence.

For most children, large descrepancies exist between visual (reading) and auditory (listening) vocabularies until they begin their formal education, usually at about age six. These descrepancies gradually diminish until equalizing between the fifth (Yates, 1937) and seventh grades (Armstrong, 1953). Armstrong reports the following vocabulary counts using two hundred subjects in grades one through eight.

Age	Vocabulary Size	
	Visual	Auditory
6.5	648	3048

7.5	1184	3476
8.15	1900	4240
9.5	4040	5120
10.5	6040	6600
11.5	6080	6640
12.5	7240	7480

Though research evidence is sometimes in disagreement, comprehension of materials which are listened to is superior to comprehension of materials read visually until about this same age and grade level. (Appendix A, Part 2) This is no doubt related to the relative growth in the size of auditory and visual vocabularies as the child receives reading instruction throughout the elementary school years. Once the child has mastered reading skills and developed a reading vocabulary at least equal to his auditory vocabulary, reading becomes a more effective media for learning.

Factors which Influence Reading and Listening Vocabularies

Yates (1937) found that intelligence was more highly correlated with reading vocabulary than with oral vocabulary for children in grades three to six. Anderson and Fairbanks (1937) concluded that both types of vocabulary were found to be closely related to general intelligence. They administered the Iowa Silent Reading Test to 220 college freshmen. Two forms of the Inglis Test of English Vocabulary were also given the Ss, one administered orally and one administered in its usual written form. Correlations of .80 for oral and written vocabulary, .61 for oral vocabulary and the reading test and .80 for reading vocabulary and the reading test were reported. Kegler (1959) studied the depth of understanding in reading and listening vocabularies of eighth, tenth, and

twelfth graders. In his study the claim that high intelligence is associated with reading vocabulary was not substantiated.

Kegler concluded that even though there was considerable overlap between the grades, grade level was an important criterion of insight into word meaning in reading vocabulary. This was not the case for listening vocabulary. Weir (1951) found varying relationships between reading and listening vocabularies at the various grade levels between grades one and eight. The varied factors which determine grade placement as well as wide individual differences in such things as intelligence, socio-cultural background, and academic achievement no doubt contribute to the fact that no clear statistical relationship has been demonstrated for grade level and reading or listening vocabularies.

Auding Vocabulary as a Predictor of Reading Achievement

Some attempts have been made to use listening ability as a predictor of reading achievement. Owen (1957) found that a listening comprehension test, the Durrell-Sullivan Reading Capacity Test of Mental Maturity or the Lorge-Thorndike Intelligence Test, yielded a more adequate prediction of reading achievement than any of these measures separately. Ss came from grades two, three, and four. Moe (1957) studied the relationship of auding and reading performance in grades one, two and three. Auding is defined as the process of comprehending and interpreting spoken language. It was hypothesized that auding ability was a useful predictive measure of reading performance, especially for first graders and especially when used in combination with measures of mental age. Results supported these hypotheses. Launder-

ville (1958) demonstrated that an author-made Reading Readiness Listening Test was as effective in predicting success in reading as was the Stroud-Harrison, a standardized reading readiness test. Schultz (1958) administered a vocabulary test in both oral and written forms to 224 fifth and sixth graders. Pupils who scored higher on the silent vocabulary than on the oral vocabulary test had significantly higher reading achievement as measured by the California Reading Test, than pupils scoring higher on the oral vocabulary test. This finding supports the fact that for those children who read well, and in this case, whose reading vocabularies are superior to their listening vocabularies, reading is superior to listening. Schultz also suggested that administering a vocabulary test orally after it has been given in written form, can be useful in evaluating pupils' reading potential.

In as much as reading vocabulary and reading skills are in the process of emerging during the elementary years, listening vocabulary may well be an essential element in predicting reading success.

Reading vs Listening Vocabularies of Braille Readers

The relationship between tactual and auditory vocabulary for braille readers has not been systematically investigated. There is some reason to believe that the point at which braille reading vocabulary equals auditory vocabulary is somewhat later than would be expected for print readers. Very often blind students are somewhat older than their sighted counterparts relative to grade level achievement (Hayes, 1941; Lowenfeld, 1945). Blindness may also cause limitations upon physical mobility and environmental experience to the extent that verbal skills,

including listening are more highly developed. Developed, in this sense, refers to the dependency a blind child may have upon his listening and speaking skills. Harley (1963) points out that blind children may be able to verbalize readily about their surroundings, however an actual concept may be an abstraction built upon an abstraction which may result in an inaccurate understanding of the environment. Other writers (Cutsforth, 1951; French, 1932; Chevigny & Braverman, 1950) have also been concerned with this problem. However verbalism is not an issue here, except to point out the highly verbal nature of the blind child's interaction with his environment and the affect this may have on auditory vocabulary development. Due to the highly complex nature of the braille code, braille reading skills may require a longer time for mastery, with a consequent delay in the equalization of reading and auditory vocabularies. For the braille reader of low mental ability, this equalization may never occur and auditory vocabulary will remain superior. Capitalizing upon this strength, audition, the blind slow learner may be exposed to a greater variety of educational materials he can understand.

Summary

It can be concluded that listening vocabulary for the elementary school child exceeds his reading vocabulary. This is not the case for high school or college students who have attained basic reading skills and whose reading vocabularies, through time and exposure, have equaled, and in most cases surpassed, listening vocabularies. The point at which reading vocabulary equals auditory vocabulary appears to be at about age

twelve (seventh grade). From this point on, more emphasis is placed upon reading to learn, rather than learning to read, with subsequent growth of visual vocabulary.

The fact that listening comprehension exceeds reading comprehension in the elementary grades is probably related to vocabulary development. Once reading vocabulary has equaled auditory vocabulary, reading comprehension may then exceed listening comprehension.

The point at which tactual reading vocabulary equals auditory vocabulary may be somewhat later than the equalization of visual and auditory vocabularies. The braille reader with low mental ability may never develop a tactual vocabulary or tactual reading skills to the degree that braille is more effective than listening for learning.

Part 4

Use of Readability Formulas to Determine Listening Difficulty

The validity of using readability formulas to determine the difficulty level of material presented auditorily is not a new concern. Chall and Dial (1948) first raised the issue when studying listener understandings of news broadcasts. Consonant with Flesch's findings (1946) that interest appeal in advertisements was related to reading ease, Chall and Dial proposed that interest was an important factor in measuring how easy or hard material was to understand when heard as well as when read. Eighteen newscasts whose difficulty and interest levels had been determined by the Dale-Chall and Flesch Formulas, were presented to 100 college freshmen. It was found that scripts that had low predicted difficulty by the formulas were understood best and were judged by the Ss to be most interesting, when listened to. It is pointed out that readability formulas do not have perfect prediction even for reading, though they provide good approximations of difficulty level. The authors concluded that predictions from readability formulas were good estimates of listening difficulty for college freshmen, but that with fairly difficult material, beginning at about ninth grade, listening difficulty was underestimated by approximately two grades. Brown (1950) reported the same two year discrepancy for the high school grades. An underestimation means that material determined to be at a particular grade level is actually more difficult, by about two grades, when listened to.

Similar estimates for the elementary grades were not found in the literature. Since there is a discrepancy between reading and listening vocabularies up until the end of the elementary grades, a reverse relationship may exist. That is, in the elementary grades, readability formulas will over-estimate listening difficulty and inflate the demonstrated advantage of listening over reading for young children. The extent of this over-estimation will remain conjecture until normative data for listening level of difficulty are obtained. Only then can listenability formulas be devised.

When considering the development of a formula for listenability, it is doubtful that the same elements of readability formulas are applicable. This is due, in part, to the differences which exist in the encoding and decoding processes for the two modes. Manion (1953) compared structural indexes adopted in readability formulas to determine difficulty level with three criteria devised to measure listening difficulty. Structural indexes were (a) sentence length, (b) prepositional phrases, (c) definite words, (d) unfamiliar words, and (e) word length in syllables. The three listening difficulty criteria were labeled (a) listener understanding during discussion, (b) listener understanding following discussion, and (c) clarification requested. The oral communication of 29 college freshmen engaged in one of four small discussion groups was analyzed according to structural indexes and three criteria to measure listening difficulty. No significant relationship existed between the three criteria of difficulty for listening and the structural indexes of difficulty. "One conclusion would be that the five

indexes are not useful measures of structural difficulty in spontaneous oral communication. The second conclusion would be that the three criteria are not useful measures of listener difficulty (p. 151)." The available review of Manion's study does not report the method used for scoring the criteria for listening difficulty, but it would appear that a comparison of subjective and objective data would lead to results which are difficult to interpret. An analysis of text material rather than spontaneous discourse, using this method might be a reasonable line of inquiry. But the fact remains that the elements of readability and listenability may be quite different.

As Chall and Dial (1948) point out, the answer to the question, "... can difficulty levels for printed material be used for spoken materials," is dependent upon how much we want listeners to get out of what they have heard. Intelligence influences comprehension regardless of modality. We do not, however, measure a person's reading ability by an intelligence test alone. Standardized intelligence tests are used as predictors of school success which includes many elements in addition to reading skills. It is not uncommon to find widely varying reading abilities among children with equal measured intelligence. Therefore, to insure the most meaningful measure possible, listening ability should be measured by a listening yardstick. The brief attention given to this subject during the fifties, has not inspired additional work on the problem of readability vs listenability. The determination of difficulty level of spoken materials by readability formulas is widely practiced in current literature. The inequality of difficulty level between the two modali-

ties is not specifically addressed other than to acknowledge its existence and recommend that a formula for listenability be devised. Until this task is undertaken and there is a method for objectively determining difficulty level for material presented auditorily, there may be no other recourse than to use readability formulas for this purpose. At least a measure of objectivity is retained and a frame of reference is provided.

Ashcroft (1960) suggests that readability formulas under-estimate braille reading difficulty due to the complexity of Grade 2 or fully contracted braille. This would increase, to an even greater extent, the projected discrepancy between difficulty level of the two modes, reading and listening, for braille readers in the elementary grades. We are willing to accept this inequity in terms of what it is we want the children to learn from materials presented, regardless of modality. The inequity may detract from the statistical comparison, but on a priori level, a pre-existing advantage for listening enhances the argument for increased auditory presentation of materials for braille readers of limited intellectual ability.

In the present study, two passages were determined to represent second and sixth grade levels of difficulty by readability formulas. If there is a pre-existing advantage for those who listened to the material, we would expect the main effect of mode to be significant. This was not the case. There were apparently no differences between the performance of those who listened and those who read materials at each level of difficulty when all factors were considered. This finding may be

due to the fact that children who comprehend at a low level when reading, will also comprehend at a low level when listening.

APPENDIX B

Feasibility Study for S Classification Procedure

APPENDIX B

Feasibility Study for Ss Classification Procedure

As part of a braille reading study, Nolan and Kederis (1969) administered a portion of the Gates Basic Reading Test to 321 braille readers for the purpose of obtaining reading rate and comprehension scores. The test, Reading to Appreciate General Significance, included 24 short paragraphs with a multiple choice question following each. The scores of 95 Ss whose IQ's were below 85 were subjected to additional analysis to determine the feasibility of using a median score of 20 for comprehension level with a median reading speed of 50 wpm was obtained for the entire sample. Ss were then grouped according to their comprehension level, above or below the median, in combination with reading speed, also above or below the median. The following distribution was obtained:

	Comprehension	
	Above Median Score of 20	Below Median Score of 20
Above Median Reading Speed 50 wpm	n = 31	n = 18
Below Median Reading Speed 50 wpm	n = 23	n = 23

A Pearson Product Moment correlation of -.142 was obtained for reading time and IQ. A similar low, negative correlation (r = -.043) for reading time and chronological age was obtained, indicating no

significant relationship between reading time and either CA or IQ. A tetrachoric correlation (Guilford, 1950) of .21 (r_t = .161) was non-significant at the .01 level of confidence for reading speed and comprehension, leading to the conclusion of orthogonality between the two variables. However, these coefficients may be underestimates of the extent of the relationship due to restricted range on all variables.

When groups were compared with respect to IQ by means of a Kruskal-Wallis analysis of variance (Siegel, 1956) they were found to be significantly different to a high degree. As reading speed does not appear to be related to CA or IQ, the relevant variable which appears to contribute to this effect is comprehension. Closer inspection of the data indicates that older, more intelligent Ss comprehend at a higher level than do younger, less intelligent Ss.

As reading speed and reading comprehension level do appear to be independent for braille readers of low mental ability, they could be used as independent control variables in this study. Intelligence is generally accepted as related to comprehension level, but grouping Ss on the basis of IQ alone may limit the extent to which inferences can be made. By designating reading speed and reading comprehension level as control variables and forming groups according to operationally defined levels of performance on a combination of the two, experimental findings can be more meaningfully interpreted.

APPENDIX C

Feasibility Study for using The Speed Test, Gates Reading Survey, to Classify Ss

APPENDIX C

Feasibility Study for Using the Speed Test, Gates Reading Survey, to Classify Ss

Thirty Ss from the Kentucky School for the Blind with IQ's below 90 and who met other subject selection criteria were given the Speed Test of the Gates Reading Survey to determine its feasibility as a measure of speed and comprehension. Additional analysis of data collected by Nolan and Kederis (1969) using a portion of the Gates Basic Reading Test (Appendix B) yielded an extreme negatively skewed distribution toward a perfect score. By using the Speed Test, number of items was increased from 24 to 64. It was hoped that by using a longer test, a greater range of performance would result. A median comprehension score of 58 resulted with a range of nine to 63. Median reading time was 56 minutes, 29 seconds, or approximately 38 words per minute. This reading time reflects time spent marking answers as well as reading the items. When data was analyzed on only those subjects with IQ's of 85 or below (n = 15), a median comprehension score of 54 and a reading time of 52 minutes, 36 seconds was obtained. Both analysis indicate that the Speed Test also has a low ceiling for the sample tested. Reasons for the obtained distribution may include the following:

(a) Admission procedure in schools for the blind are such that only the upper end of the distribution of low IQ blind children are available for study. The range in this sample is 71-85 IQ.

(b) Reading level of at least second grade is required in order to take the test. Younger and less intelligent students are therefore ex-

cluded from the sample.

(c) There may be errors of measurement associated with IQ scores available for Ss in the sample. This is due in part to the instruments available for use with the blind and in part to the age of the Ss when the measures were taken. School records of IQ's are often considerably out of date. Some students may be functioning at a level considerably above expectations according to the measured IQ available for them.

Results of the feasibility study sufficiently supported the use of the Speed Test for the purpose of roughly discriminating among Ss so that they could be classified operationally in terms of their reading speed and comprehension level.

APPENDIX D

Special Instructions for Administering the Speed Test of the Gates Reading Survey

APPENDIX D

Instructions for administering the Speed Test of the Gates Reading Survey

Say: "You have been selected to help with a study on reading at the American Printing House. To do this we are asking that you take a reading test. The test booklets and pencils for marking your answers will be passed to you now."

Pass one test booklet and a pencil to each subject.

Say: "The test contains a number of short paragraphs followed by a question. You are to read each item and the four possible answers. When you have decided which is the correct answer, mark it by drawing a line through it with your pencil. Have you taken tests like these before?"

Encourage a reply and answer any questions.

Say: "Look at the top of your booklet at the section called 'Directions.' Read silently while I read aloud."

"Directions: Read these paragraphs. Draw a line through the word which best answers the question. Draw a line through one word only. Do the exercises as rapidly as you can without making errors."

"Let's also do the sample which follows together."

"Sample: The sun is warm in summer. Boys and girls like to swim and play games on the grass. When do we get very hot days?"

winter

spring
summer
fall

Encourage answers.

"Of course! Summer is when we get very hot days. Summer has been underlined in your booklet. Take your pencil and mark the word 'summer.' We will come around and see that all have marked their booklets correctly."

Check all subjects and give any help necessary.

Say: "We will all begin at the same time and not until I say 'go.' When you come to the end of a page, go right on to the next. If you make a mistake and wish to change an answer, raise your hand and we will come around and help you make the change.

As soon as you have finished the entire booklet, raise your hand immediately. Do not take it down until someone comes to your desk and collects the booklet.

If you come to a word you do not know, skip over it and read on. Do all of the questions and do the best you can. Work quickly and remember to raise your hand as soon as you finish.

Put your finger on Number 1."

Check to see that all are ready to begin

"Ready.....Go!"

Additional Instructions to the Examiner

1. Try to assure yourself that all students know what is expected of them before the testing session begins.

2. Circulate about the room to make sure all students are following instructions.

3. If a child wishes to change an answer, write "no" over the incorrect choice, and let him mark again.

4. Give no help and avoid having conversation with students. Merely say, "Do the best you can."

5. Note any unusual behavior on a separate sheet to be attached to the test booklet when times are recorded and booklets picked up.

6. When a child raises his hand upon completion of the test, immediately note the time, to the nearest second, on his booklet and quietly ask his name. Record the student's name and his reading in the margin of the first page of the test booklet.

7. Attach any notes made about the child's test behavior. Such things as, excessive daydreaming, inability to follow instruction, leaving the room, etc. should be considered important as they will effect the child's reading time.

APPENDIX E

Instructions for Administering Experimental Passages and Comprehension Tests

APPENDIX E

Instructions for Administering Reading Passages and Comprehension Tests for "Portugee" and "The French Foreign Legion" to Ss who Read in Braille

Say: Today we will continue with our Reading and Listening Study. We will work together today and again tomorrow. Today you will read a short selection in braille and then take a test to see how much you can remember.

I will now pass to you the tests so that we can go over the directions before we begin reading.

Pass out appropriate test booklet for the selection to be read by this particular group.

Say: Look at the top of your booklet at the section called "directions." Read silently while I read aloud.

Directions: Read these questions silently while the Examiner reads them aloud. Each question and its possible answers will be read through twice. Make a mark through the word or words which best answer the question. Be sure to mark directly through the answer you have chosen.

This is like the test you took before. Do you remember? The only difference is that I will read each question and its answer through twice.

Lets do the samples which follow.

Sample: Cows are found on a farm and give us

cake
milk
corn
eggs

Encourage answers after reading the question and alternatives through twice.

Of course! Cows give us milk! Now take your pencil and mark through the word 'milk.' I'll come around to see that you have all marked correctly.

Check to see that Ss are marking directly through the braille answer they have chosen and give any help necessary to assure this kind of response.

Let's do the next one also.

At Halloween time, children often

decorate a tree
make a snowman
make a Jack-o-lantern
hunt for eggs

Encourage answers after reading the question and alternatives through twice.

Of course! We make Jack-o-lanterns at Halloween time! Mark through "make a Jack-o-lantern" in your booklet.

Check again to see if Ss are marking booklets appropriately.

We will do the rest of the test the same way. I will read the question through twice while you read it silently. When you have chosen your answer, mark through it with your pencil.

If you wish to change an answer or need help of any kind, raise

your hand.

Now, place your test booklet and pencil aside. (Examiner may wish to collect booklets if there is not enough room to put the tests aside.)

I will now pass to you the reading selection. The name of the story is _____. Do not begin until I tell you to do so. Raise your hand as soon as you have finished and I will collect your booklet. Then, please sit quietly until all have finished and we can begin the test together.

Are there any questions?

As soon as all are ready, begin reading by saying, "Begin."

Collect booklets as Ss finish.

When all have finished, begin testing immediately by saying,

Open your test booklet to page __. Number 1. "When the story starts.....etc.

Be sure to read each item and its alternative through twice.

Note: On the second day of testing follow this same procedure.

APPENDIX E

Instructions for Administering Comprehension Tests for "Portugee" and "The French Foreign Legion" to Ss who Listen

Say: You have been selected to help with a study at the American Printing House for the Blind. First you will listen to a selection which has been recorded. You will then take a test to see how much you can remember from listening.

I will now pass to you a test booklet and a pencil for marking. Do not open your book or mark on it until I tell you to do so.

Pass each Ss a test booklet for the appropriate passage and a pencil.

Say: Look at the top of your booklet at the section called "directions." Read silently while I read aloud.

Directions: Read these questions silently while the Examiner reads them aloud. Each question and its possible answers will be read through twice. Make a mark through the word or words which best answer the question. Be sure to mark directly through the answer you have chosen.

Say: Have you taken this kind of test before?

Encourage replys and answer any questions at this time.

Lets do the samples which follow.

Sample: Cows are found on a farm and give us

cake
milk
corn
eggs

Encourage answers after reading the question and alternatives through twice.

Say: Of course! Cows give us milk! Now take your pencil and mark through the word "milk." I'll come around to see that you have all marked correctly.

Check to see that Ss are marking directly through the braille answer they have chosen and give any help necessary to assure this kind of response.

Say: Let's also do the next one.

At Halloween time, children often

decorate a tree
make a snowman
make a Jack-o-lantern
hunt for eggs

Encourage answers after reading the question and alternatives through twice.

Say: Of course! We make Jack-o-lanterns at Halloween time! Mark through "make a Jack-o-lantern" in your booklet.

Again check to see if Ss are marking booklets appropriately.

Say: We will do the rest of the test the same way. I will read the question through twice while you read it silently. When you have chosen your answer, mark through it with your pencil. If you wish to change an answer or need help of any kind, raise your hand. Are there any questions?

Now, place your pencil and test booklet on the table and get ready to listen. The name of the story you are about to hear

is _____. Listen carefully for we will take the test as soon as the story is over.

Are you ready to listen?

Be sure you have the attention of all Ss and then begin the appropriate tape.

As soon as the story is completed,

Say: Open your booklets to page 1. Read silently while I read aloud.

1. When the story starts, etc.

When you have read the question through twice,

Say: Now mark directly through the answer you have chosen.

Continue through the entire test reading each question twice.

Suggestions to the Examiner

1. Be sure all Ss understand how to mark their answers. Give whatever help is necessary to achieve this.

2. Your own brand of banter to achieve rapport is acceptable.

3. If a student wishes to change an answer, write "no" by the one he has already marked and instruct him to mark again.

4. It is a good idea to carry several pencils with you as you circulate through the room as they are often dropped. Suggest to the boys that they put their pencil in their shirt pocket, if they have one, while reading, then take it out to mark.

5. Make sure students are using right end of their pencils and that it is making a mark that can be seen. You may have to change pencils if the point is not long enough. Also discourage very hard marking as it tends to spoil dots on the following pages.

6. Discourage reading ahead. Try to pace your reading speed so that every one has time to mark their answers so that there are no long periods between items.

7. Circulating through the room enables you to catch errors in marking, give help, and pace your reading better than staying in one place.

8. Listening to the tape and taking the associated test requires about 50 minutes.

Special Procedure for Experimental Testing

Comprehension tests over experimental materials were administered to Ss by simultaneous presentation of items both auditorily and tactually. All Ss, regardless of the mode in which they received experimental materials, were provided with individual braille copies of the tests. The items were read aloud twice as the Ss read silently. Time was given between the reading of items for the purpose of marking answers. This method of testing was an attempt to eliminate possible bias associated with poor reading skills and to obtain the most accurate measure of what had actually been learned. By providing additional cues auditorily, to material being read tactually, we can be more confident that the Ss have a better chance of understanding what is expected of them.

Hartman (1961) suggests that the problem of interference may arise from simultaneous presentation of material through two channels. If there is considerable discrepancy between rates at which the stimuli are presented, one channel may be completely disregarded. To reduce the possibility of this kind of interference from occurring in this study the E read test questions slowly at rates consistent with braille reading rates within the groups of Ss being tested. This procedure did not necessarily guarantee that interference did not occur. However, due to the poor reading skills within the sample it was felt that the assistance offered by reading the questions aloud while students read silently for the purpose of measuring the amount learned was more important that the negative effects of possible interference. It is possible that a test

administered orally over material presented in either mode would have eliminated the effects of proficiency in braille reading on the comparison and reduced chances of interference. Such a procedure was not feasible due to the large number of Ss included in the study. The question of multiple channel testing of material presented in one sensory mode needs further study. However, the method which was adopted is considered appropriate for the purposes of this study.

APPENDIX F

Experimental Passages and

Comprehension Tests

APPENDIX F

Experimental Passages and

Comprehension Tests

"Portugee"

From: Anderson, A. M. Portugee Phillips and the Fighting Souix. Chicago. Wheeler, 1956.

Gun in hand, Portugee headed for the camp. He walked slowly, feeling his way along with his moccasins.

Slowly he moved in closer to the camp. Quietly as a big cat he made his way. When he was close enough to see, he started to smile.

Good! It was not an Indian camp. Ten white men were sitting around the camp fire. They were talking and laughing with one another.

"Hello!" Portugee called. "Hello!"

The men made no answer. They went on talking and laughing.

"What is going on here?" Portugee asked himself. "Someone should have heard me. Maybe not the men around the fire. But they must have someone watching over their camp. That is if someone is on watch."

Portugee stopped dead still. Why, these men were new to the West! New to the trail. They were what he and his friends called "greenhorns."

Now Portugee and his friends had nothing against greenhorns. But it was like they said, "We know what Indians will do. But greenhorns! Stay away from them if you want to keep out of trouble."

Portugee moved in closer and took a good look around the camp. Yes, the men were greenhorns, all right. Green as grass. See where they left their guns over there by some trees.

Men like Portugee, who knew the West, had their guns with them all the time. Day and night. Night and day. On the trail and in camp their guns were never out of reach. Even when sleeping, their guns were on the ground beside them.

"I am getting out of here," Portugee told himself. "But first I must tell them the Indians are up to something."

He was about to call to the men again when he heard one say, "Yes. So far we are doing all right. But we can run into trouble any time."

"Take it easy, Bret," said another man.

"And stop talking about Indians all the time. Why we have not seen a redskin in days!"

"And that is a pretty good sign," another said.

"What do you know about Indians?" Bret asked. "What do any of us know? The West is new to us. We are greenhorns out here."

"What do you want us to do?" someone asked. "Go all the way back to Fort Laramie?"

"Yes," one of the men answered. "There are men at the fort who know the West. We could get them to take us--"

"Not on your life," cut in another greenhorn. "We do not need their help."

Portugee laughed softly to himself. He had heard some greenhorns talk like that before. But let them get into trouble. They were the first to run. The first to call for help.

"You know what I think?" the greenhorn went on. "I think the men out here make up most of this talk about Indian trouble."

"So do I," said another. "They tell us they need their help on the trail. Scouting, they call it. Well, if you ask me, it is just their way to make money."

The smile on Portugee's face set in a hard line. What was the use of trying to help these men? Let each one of them look out for himself. That was what he was going to do.

Portugee started back to his horse. But he had gone only a little way when he stopped. He turned and looked again at the little camp. No. He could not ride on and leave the greenhorns alone. He had to help them.

He stood quietly watching the men around the camp fire. Where did they think they were? At home in their own back yards? It was high time they found out a few things about Indians. What could he do to make them look out for trouble?

All at once he had the answer. Many of his friends said he looked enough like an Indian to be one. And if they said so, what would these greenhorns think?

Portugee laughed. "They will think I am a redskin for sure."

Still laughing to himself, Portugee headed for the camp. He made his way to the trees where the men had left their guns. Slowly, quietly, he made his way into the camp. Now, with the guns behind him, he was ready. He let out a wild Indian war cry.

For a long minute not a man at the camp fire moved. Then with a shout the greenhorns jumped to their feet. "Indians! Indians! All around us!"

"Hold it, boys," Portugee called. "I am no Indian."

Before the men could do or say anything more, Portugee was at the camp fire. He moved in so quickly that they just stood and looked at him. The surprise on their faces made him laugh until he cried.

Finally he said, "You may not have seen Indians. But take it from me, when you don't see any, lookout!"

"Portugee"

Directions: Read these questions silently while the Examiner reads them aloud. Each question and its possible answers will be read through twice. Make a mark through the word or words which best answer the question. Be sure to mark directly through the answer you have chosen.

Samples: Cows are found on a farm and give us

cake
milk
corn
eggs

At Halloween time, children often

decorate a tree
make a snowman
make a Jack-o-lantern
hunt for eggs

"Portugee"

1. What did Portugee have in his hand as he walked to the camp?

   his gun
   his hat
   a stick
   a knife

2. How did he walk?

   quickly
   with a limp
   slowly
   rapidly

3. He felt his way along with his

   hands
   feet
   body
   moccasins

4. He moved as quietly as

   an Indian
   a big cat
   a small bird
   a lion

5. When he was close enough to see, he

   began to cry
   lay down in the grass
   turned around
   started to smile

6. Portugee was glad because

   it was not an Indian camp
   it was an Indian camp
   he was hidden
   it was night

7. How many men did he see?

   two
   ten
   four
   three

8. They were sitting around

some trees
their horses
the camp fire
a tent

9. What were they doing?

eating dinner
sleeping
talking and laughing
feeling very afraid

10. What did Portugee do?

called to them
slipped away
shot his gun
walked into camp

11. What did the men do?

invited him in
drew their guns
made no answer
ran away

12. Portugee felt that someone should have

heard him
said hello
put out the fire
come to greet him

13. Portugee wondered if someone was

coming to meet him
watching the camp
cutting firewood
hiding in the trees

14. Portugee decided the men were

hunting
new to the West
afraid of Indians
camped for the night

15. Portugee and his friends called men like these, "Greenhorns" because they

played musical instruments
were from California
were new to the trail
liked them

16. How did Portugee and his friends feel about the Greenhorns?

They had nothing against them
They knew they were smart
They didn't like them
They were their best friends

17. Portugee and his friends would say, "If you want to stay out of trouble,

stick with the Greenhorns!
stay away from the Greenhorns!
move to the East!
go to California!

18. Portugee moved in closer to

get warm by the fire
look for their horses
take a good look at the camp
listen to them talk

19. What had the Greenhorns done with their guns?

Stacked them neatly
Had them in their laps
Put them over by some trees
Hung them in the trees

20. Who knew the West?

Men like Portugee
Men from California
Greenhorns
Young men

21. Where did these men who knew the West keep their guns?

In a saddle bag
Never out of reach
With them during the day
In their cabins

22. Portugee decided to tell the Greenhorns that

the Indians were up to something
they should move on
to keep their guns close
he was there

23. The Greenhorns felt that they were

in danger
brave
going to have company
doing all right so far

24. The Greenhorns had not seen any redskins

in weeks
for a month
for several hours
in days

25. They felt that not seeing Indians was a

bad sign
good sign
sign that they were gone
miracle

26. Bret asked,

What do you know about Indians?
Is someone coming?
Do you know a scout?
What do you know about customs of the West?

27. Bret realized that they were

in great danger
being very kind
Greenhorns in the West
talking too much

28. One of the men asked if they should go back to

Cincinnati
the East
Fort Laramie
Fort Boonsboro

29. One of the men felt they did not need

guns
help
extra food
experience

30. What the men said made Portugee

very mad
laugh to himself
cry a little
happy

31. Who were the first to run when trouble came?

Indians
Scouts
Villagers
Greenhorns

32. What else did they do when trouble came?

call for help
hide in the trees
ride away on horses
give themselves up

33. One man thought that most of the talk about Indian trouble was

true
made up
important
fantastic

34. The men of the West told the Greenhorns they needed

guns
money
Scouts
the army

35. One Greenhorn thought men of the West were trying to

scare them
make money
make friends with the Indians
make friends with the Greenhorns

36. Portugee thought each man should

look out for himself
go back home
carry a pack
have a horse

37. When he heard the men, Portugee started to

go back to his horse
fire his gun
help them
feel better

38. Portugee decided that he could not

help the men
leave the Greenhorns alone
listen to anymore
travel farther that night

39. The Greenhorns seemed to think they were in

their own back yards
plenty of danger
the West
another country

40. Portugee wanted to do something to make them

go home
carry their guns
happy
look out for trouble

41. Portugee looked very much like

a Greenhorn
a Scout
an Indian
an animal

42. Portugee wanted the Greenhorns to think he was a

bear
redskin
hunter
scout

43. Portugee made his way into the

trees
camp
bushes
firelight

44. The Greenhorns' guns were

in front of him
by the trees
behind him
well hidden

45. When Portugee was ready, he

ran into the camp
gave an Indian war cry
gave the men a talk
fired his gun

46. When the Greenhorns heard Portugee, they

paid no attention
laughed at him
jumped to their feet
looked to see who it was

47. The Greenhorns thought Portugee

was a scout
was an Indian
was many Indians
was an animal

48. Before the men could do or say anything, Portugee

had run away
was at the campfire
fired two shots
rode his horse away

49. The men were

angry
happy
surprised
laughing

50. The looks on the Greenhorns' faces made Portugee

very sad
laugh until he cried
jump up and down
speak kindly to them

51. Portugee told the Greenhorns that if they didn't see any Indians

to move along
to look out
to turn back
there was no danger

APPENDIX F

Experimental Passages and Comprehension Tests

"The Foreign Legion"

From: Blassingame, W. The French Foreign Legion. New York: Random House, 1955.

It was a time of great upheaval throughout Europe, as so many times have been. In a short, hopeless war Poland had attempted to gain its freedom from Russia, and now the Poles who had fought against the czar were fleeing from his armies. In Germany, Austria and Italy there had been uprisings. From all over Europe men were pouring into France seeking sanctuary. Many of them were trained soldiers. Why not give them a chance to enlist under the French flag and go to fight the Moors in Africa?

It was not an altogether new idea. Many countries, from the very beginning of history, have made a practice of hiring foreign soldiers. The Pope had a Swiss guard, and so had a number of earlier French kings. George III of England had hired German soldiers to fight against the Colonies in the American Revolution.

So at first there was nothing particularly unusual about the French Foreign Legion. A Frenchman could join if he wished, and so could anyone else. There were seven battalions, and two of these were made up of Swiss. The Swiss have traditionally served as professional soldiers for France. Once an officer from another country said to a Swiss soldier in the Legion, "You Swiss always fight for money. In my country we

fight for honor."

The Swiss soldier merely looked at him. "Yes," he said. "Everyone fights for what he needs most."

It was in the spring of 1832 that the Legion landed in Africa. They were something to see, these men who were to develop into the world's greatest fighting unit. They wore the uniform of the regular French infantry: red trousers and a heavy blue coat with a high collar--a poor uniform for the blistering heat of Africa. Their flag was a French tricolor, and on it was the picture of a rooster standing on top of a globe marked "France." Under this were the words, The King of the French to the Foreign Legion.

They came from all over Europe, these men. There were big men and small ones. There were men of royal blood and men who could not write their names. There were criminals and boys who had never yet needed to shave.

But they had one thing in common, one thing that Legionnaires have always had in common and must have: They were brave.

From the beginning the Legion fought well, and fought often. It pushed back the Moors. It built the first of the many roads that Legionnaires would build. And it suffered a crushing defeat in its first major battle.

Under a General Trézel the Fourth and Fifth Battalions were sent out to capture the white-walled city of Constantine to the east of Algiers. It was from here that Ahmed Bey sent warriors to harry the French, so the French generals felt the city must be taken.

The Legion never reached it. In a narrow gap in the mountains they were met by Abd-el-Kader, the leader of all the Arabs, and a force that outnumbered the Legion four to one. With their red trousers and blue coats gleaming in the sun, the Legionnaires attacked but could not break through. Then the Arabian cavalry swooped upon them, a foot soldier riding behind each cavalryman. The Legion retreat was cut off. The carts carrying the wounded were upset and many of the wounded butchered. When finally the battalions fought clear, they had lost more than a quarter of their men.

And shortly afterward something happened that has never happened again in all the Legion's history. The King of France loaned the whole Legion-men, guns and equipment-to the Queen of Spain! And the Legion sailed away to fight for her.

It all came about in an odd way.

Ferdinand VII, King of Spain, had died leaving a baby daughter as his only child. According to the old law only a man could rule, but before his death Ferdinand VII had changed this. He ordered that the throne should go to his child whether it was a boy or a girl. His wife was to rule as regent until the child was old enough to take over. The King's brother, Don Carlos, opposed this. The throne, he said, was rightfully his after his brother's death. So there was civil war between the followers of the Queen Regent, Maria Cristina, and those of Don Carlos. It was to help Cristina that Louis Philippe loaned her the Foreign Legion in 1835.

And it was now that the Legion began to take shape, to turn into

that strange and wonderful body of fighting men it has been ever since.

Until this time various nationalities within the Legion had been segregated. But when the Legion went into Spain, this was changed. Men of all nations were mixed together in the same battalions and much of the old jealousy ended.

"The Foreign Legion"

Directions: Read these questions silently while the Examiner reads them aloud. Each question and its possible answers will be read through twice. Make a mark through the word or words which best answer the question. Be sure to mark directly through the answer you have chosen.

Samples: Cows are found on a farm and give us

cake
milk
corn
eggs

At Halloween time, children often

decorate a tree
make a snowman
make a Jack-o-lantern
hunt for eggs

"The Foreign Legion"

1. When the story starts, the times in Europe were

   full of unrest
   very peaceful
   happy for the people
   prosperous

2. Poland attempted to gain its freedom from

   Germany
   Italy
   Russia
   Austria

3. From whose armies were the Poles fleeing?

   The Foreign Legion
   The Polish Czar
   France
   The King

4. There had also been uprisings at this time in

   Germany, Austria and Italy
   France and Spain
   America and Britain
   Africa, America and Russia

5. All over Europe people were seeking sanctuary in

   Russia
   France
   America
   Italy

6. Where was France fighting when the Legion was founded?

   Spain
   Italy
   Russia
   Africa

7. The practice of hiring foreign soldiers was

   a new idea for the times
   considered unethical
   a practice of many countries
   was only done in France

8. The Pope and a number of early French Kings had a

   Spanish Guard
   English Guard
   German Guard
   Swiss Guard

9. What country did the soldiers come from that King George hired to fight against the Colonies in the American Revolution?

   Germany
   France
   Austria
   Italy

10. At first, the French Foreign Legion was

    considered very unusual
    was not considered unusual
    objected to by the French
    objected to by other countries

11. Who could join the French Foreign Legion?

    Frenchmen only
    The French or English
    Anyone
    French and Germans

12. How many battalions were there?

    two
    seven
    ten
    fifty

13. How many battalions were made up of Swiss soldiers?

    one
    ten
    two
    seven

14. Who have traditionally served as professional soldiers for France?

    The Austrians
    The Germans
    The Swiss
    The Americans

15. Swiss soldiers fought for

honor
money
medals
revenge

16. In 1832, the Legion landed in

Africa
Spain
America
Germany

17. The landing took place in the

fall
spring
summer
morning

18. What color were the uniforms of the French Foreign Legion?

yellow and purple
red and blue
black and white
red and white

19. The uniforms of the French Foreign Legion were the same as the

French Navy
Russian Infantry
Policemen in France
Regular French Infantry

20. The collar on the coat was

high
round
red
low

21. How was the uniform suited for African weather?

It was well suited.
The colors were too bright.
It was not warm enough.
It was too heavy.

22. What animal was on the flag?

bull
crow
rooster
horse

23. The animal on the flag was standing on a

box
boat
hill
globe

24. The one thing Legionnaires had in common was their

size
bravery
education
age

25. The Legion fought

well
poorly
rarely
occasionally

26. In addition to fighting, the Legionnaires

raised families
built cities
taught school
built roads

27. As a result of the Legion's first major battle, they

were victorious
were badly defeated
pushed back the Moors
changed their uniforms

28. Which battalions did General Trézel send to capture Constantine?

1st and 2nd
4th and 5th
4th and 8th
5th and 8th

29. The city of Constantine

had a white wall around it
was unguarded
was very small
was in Greece

30. Constantine is located near

Algiers
Spain
America
Greece

31. The Legion met the Arab army

in an open field
in a narrow gap
on the desert
in the city

32. The Legionnaires were outnumbered

20 to 1
100 to 1
10 to 1
4 to 1

33. When the Arab cavalry attacked

they were quickly defeated
there were two men on each horse
the Legionnaires were afraid
cannons were fired

34. When the retreat was cut off, the wounded Legionnaires were

shown mercy
unharmed by the Arabs
taken as prisoners
butchered

35. How many men were lost in the battle?

about half
very few
not a single one
more than a quarter

36. What did the King of France do with the Legion that has never happened again?

He loaned the Legion to the Queen of Spain.
He gave them all new uniforms.
He took away their guns and equipment.
He gave them ships.

37. When Ferdinand VII died, how many children did he have?

one son
two daughters
a baby daughter
two sons and a daughter

38. According to Law, the only person who could rule in Spain was

a man
the King's wife
the King's brother
the son or daughter of the King

39. What did Ferdinand do before he died? Before Ferdinand VII died, he

changed the law
was very ill
moved to France
became father of a son

40. Who was to rule Spain until the baby was old enough?

the King's wife
the King's brother
a Prince in Spain
the King of France

41. Who was against the change in the law?

The Queen Regent
Ferdinand VIII
France
Don Carlos

42. Because of the disagreement about who was to rule Spain,

an election was held
a civil war broke out
the people agreed to Ferdinand's wishes
the baby became King

43. Who did Louis Philippe, the French King, believe should rule Spain?

Maria Cristina, as Regent
Don Carlos, as King
a Frenchman
himself

44. After fighting for Spain, how were battalions of the Legion formed?

segregated by nationality
all nationalities were mixed
only Frenchmen were officers
only Frenchmen could belong

45. By forming battalions differently,

the men became dissatisfied
the Legion lost popularity
old jealousies ended
the Legion dissolved

APPENDIX G

Design of the Study

APPENDIX G

Design of the Study

A 2 x 2 x 2 x 2 factorial design with repeated measures on the fourth factor, difficulty level of the material, was employed to analyze data obtained in the study (Winer, 1962, Ch. 7). A graphic representation of the design is found in Figure 2. It may be conceptualized as two, Lindquist Type III designs.

Differentiation between the effectiveness of modes, either reading in braille or reading by listening, was determined by comparing the amount of material learned in each mode. The amount learned was demonstrated by the proportion of correct responses on reading comprehension tests over both sets of material, second and sixth grade.

Three control variables were employed: reading comprehension level (C), reading speed (S) and difficulty level of the material (D). Reading comprehension level and reading speed were determined by the Ss' performance on the Speed Test of the Gates Reading Survey (1942) which was administered in braille prior to the presentation of experimental materials. Two levels of each of these variables were designated by dividing the group on the basis of performance either above or below the median performance level of the entire group on comprehension level and reading speed. Ss were then classified according to their performance on these two variables in combination.. This method of classification resulted in the formation of four groups which are depicted in the following 2 x 2 contingency table.

Reading Speed	Comprehension: Above Median High (C_H)	Comprehension: Below Median Low (C_L)
Above Median Fast (S_F)		
Below Median Slow (S_S)		

Ss were then randomly assigned to mode of reading so that half read experimental materials in braille and half listened to them.

Repeated measures were obtained on the third control variable, difficulty level of the material (D) by presenting each Ss with two passages for reading, which had objectively determined to represent second and sixth grade level. Second grade material was designated as easy reading (D_E) and sixth grade material was designated as hard reading (D_H).

Subject variables of CA and IQ were analyzed by simple analyses of variance and t tests for the mean comparisons which were pertinent to the interpretation of the data (Edwards, 1967).

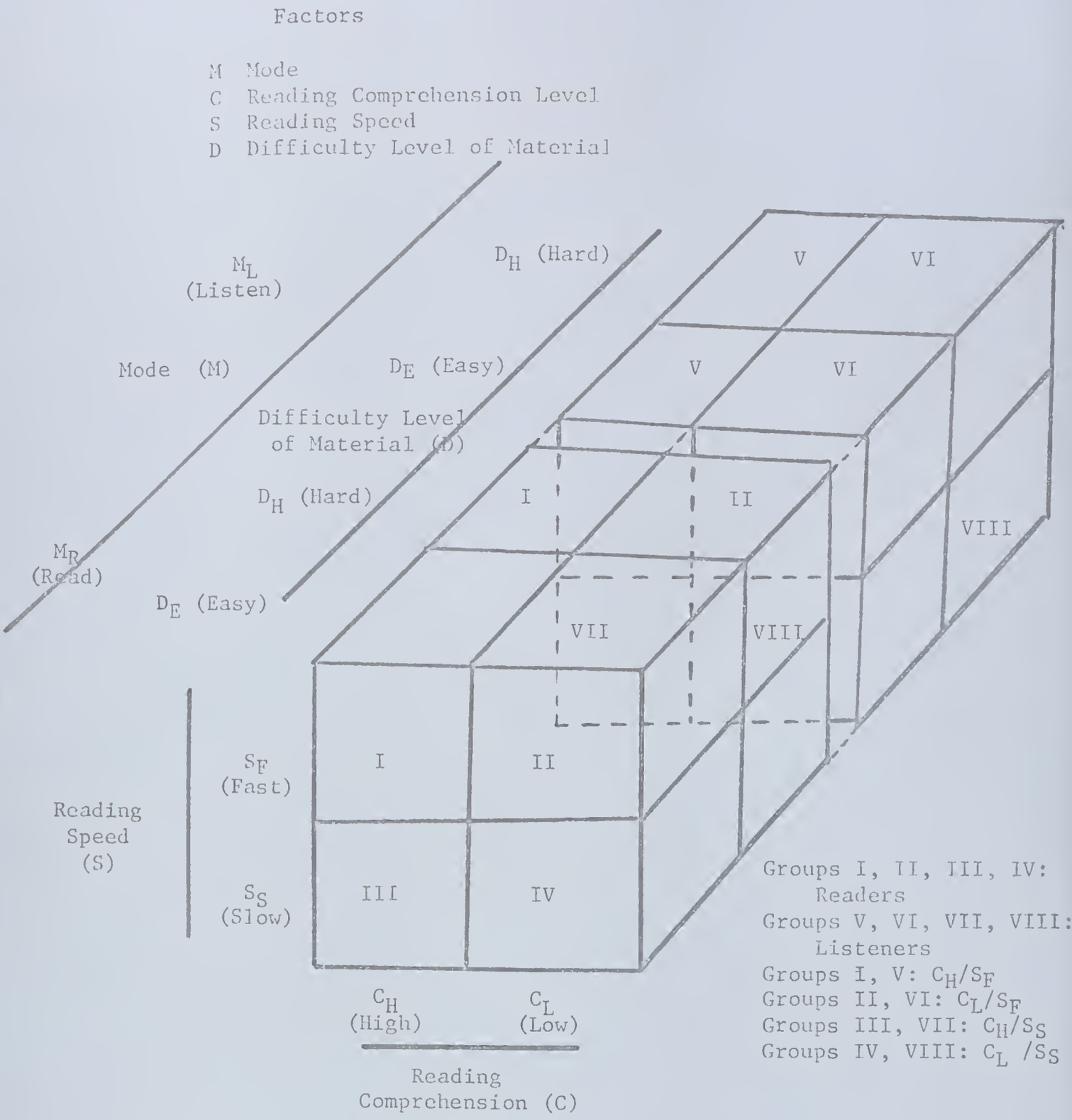

Figure 2. The 2 x 2 x 2 x 2 factorial design. The dependent variable is the amount of material learned with respect to reading mode.

APPENDIX H

Raw Data: Subject

Classification Test

APPENDIX H

Raw Scores: Speed Test of the Gates Reading Survey

Median Comprehension Score = 54

Median Reading Time = 49' 00"

N = 100

Illinois n = 19	Comprehension Score Number correct of 64 Items	Reading Time (mins. & secs.)	
1	13	33	30
2	55	36	25
3	57	50	10
4	54	31	52
5	40	69	40
6	55	19	00
7	59	78	40
8	60	90	00
9	58	39	15
10	55	71	36
11	59	28	40
12	38	55	10
13	54	44	05
14	52	83	40
15	52	77	20
16	52	71	35
17	48	61	05
18	41	51	10
19	47	33	25
Indiana n = 10			
1	52	44	45
2	57	43	00
3	54	31	50
4	53	77	50
5	61	52	20
6	55	39	07
7	60	25	52
8	55	77	58
9	21	60	25
10	53	44	15

(continued) Missouri n = 17	Comprehension Score Number correct of 64 Items	Reading Time (mins. & secs.)	
1	53	76	35
2	58	58	55
3	57	60	01
4	47	54	20
5	54	32	45
6	43	43	10
7	59	48	35
8	42	72	27
9	53	62	20
10	24	68	47
11	56	87	49
12	27	41	30
13	23	49	04
14	53	47	15
15	51	62	50
16	59	69	09
17	59	55	02
Ohio n = 38			
1	22	65	15
2	60	29	10
3	60	42	00
4	61	44	50
5	57	62	40
6	60	38	40
7	61	46	35
8	45	52	55
9	47	40	10
10	59	71	15
11	58	27	40
12	56	66	30
13	59	74	30
14	63	29	50
15	55	21	20
16	56	32	25
17	43	47	20
18	36	87	45
19	42	45	59
20	55	36	10
21	12	47	50
22	60	35	25
23	55	66	30
24	56	29	10
25	45	61	15

(continued) Ohio n = 38	Comprehension Score Number correct of 64 Items	Reading Time (mins. & secs.)	
26	59	50	10
27	45	81	10
28	60	49	00
29	12	38	10
30	40	76	30
31	34	33	30
32	14	35	40
33	17	40	00
34	23	64	25
35	21	83	05
36	56	31	45
37	42	98	00
38	55	34	00
Pennsylvania n = 16			
1	61	28	29
2	59	61	09
3	63	27	47
4	31	28	30
5	61	52	51
6	60	39	40
7	49	57	50
8	60	50	48
9	61	31	12
10	61	52	23
11	52	36	10
12	14	64	50
13	41	83	45
14	13	88	45
15	33	84	23
16	34	88	55

APPENDIX I

Raw Data: Experimental Passages

APPENDIX I

Raw Data by Dichotomized Groups According to Modality

Readers

N = 40; n = 10

HC/FS*	CA	IQ	Raw Score "Portugee" (Easy)	Proportion (# correct/51 items)	Raw Score (Hard) "French Foreign Legion"	Proportion (# correct/45 items)
1-G.J.	214	75	21	.411	16	.355
2-S.V.	160	84	41	.803	28	.622
3-J.G.	191	80	34	.666	18	.400
4-K.S.	172	72	30	.588	31	.688
5-N.G.	218	79	32	.627	23	.511
6-L.R.	220	80	22	.431	21	.466
7-E.M.	224	83	40	.784	24	.533
8-V.M.	170	81	37	.735	26	.577
9-G.E.	181	85	42	.824	34	.755
10-K.J.	162	72	45	.882	25	.555

* High Comprehension/Fast Speed

HC/SS

11-B.R.	178	71	42	.823	33	.733
12-C.J.	195	81	39	.764	12	.266
13-G.J.	159	74	40	.784	29	.644
14-K.R.	164	74	22	.431	11	.244
15-L.K.	137	84	37	.725	19	.422
16-C.R.	157	76	47	.921	28	.622
17-C.D.	198	77	34	.666	22	.488
18-R.K.	189	61	17	.333	24	.533

(continued)

HC/SS	CA	IQ	Raw Score "Portugee" (Easy)	Proportion (# correct/51 items)	Raw Score (Hard) "French Foreign Legion"	Proportion (# correct/45 items)
19-J.J.	232	74	36	.705	18	.400
20-T.S.	171	84	40	.784	25	.555

*High Comprehension/Slow Speed

LC/FS*

21-J.G.	190	70	20	.392	24	.533
22-K.P.	191	81	32	.627	24	.533
23-W.M.	173	63	21	.411	9	.200
24-E.S.	121	78	20	.392	17	.377
25-H.B.	198	73	25	.490	16	.355
26-M.D.	185	60	27	.529	16	.355
27-G.R.	114	83	17	.333	18	.400
28-F.R.	182	82	40	.784	32	.711
29-S.K.	165	79	17	.333	13	.288
30-B.P.	160	72	11	.215	10	.222

*Low Comprehension/Fast Speed

LC/SS*

31-H.J.	204	70	15	.294	21	.466
32-S.K.	189	55	15	.294	9	.200
33-M.A.	151	75	10	.196	11	.244
34-J.R.	125	83	32	.627	16	.355
35-B.J.	134	79	22	.431	19	.422
36-P.D.	191	65	16	.313	9	.200
37-M.J.	193	51	21	.411	15	.333
38-S.E.	197	81	40	.784	22	.488
39-M.C.	199	66	37	.725	18	.400
40-T.F.	228	77	25	.490	16	.355

*Low Comprehension/Slow Speed

Raw Data by Dichotomized Groups According to Modality

Listeners

N = 40; n = 10

HC/FS*	CA	IQ	Raw Score "Portugee" (Easy)	Proportion (# correct/51 items)	Raw Score (Hard) "French Foreign Legion"	Proportion (# correct/45 items)
41-L.L.	190	82	37	.725	21	.466
42-L.D.	190	84	38	.745	21	.466
43-R.L.	225	82	17	.333	20	.444
44-G.J.	185	78	15	.294	17	.377
45-A.R.	201	72	44	.862	17	.377
46-R.R.	212	80	41	.803	15	.333
47-L.M.	221	68	26	.509	13	.288
48-M.V.	128	78	28	.549	15	.333
49-A.W.	154	81	33	.647	19	.422
50-J.R.	166	81	31	.607	20	.444

*High Comprehension/Fast Speed

HC/SS*

51-D.R.	180	75	44	.862	18	.400
52-D.C.	192	79	30	.588	18	.400
53-R.J.	233	84	45	.882	35	.777
54-M.R.	182	76	47	.921	34	.755
55-M.L.	134	82	19	.372	21	.466
56-S.D.	206	69	15	.294	17	.377
57-C.J.	210	76	21	.411	15	.333
58-B.J.	147	84	28	.549	22	.488
59-A.S.	192	79	47	.921	21	.466
60-P.T.	217	84	19	.372	15	.333

*High Comprehension/Slow Speed

(continued)

LC/FS*	CA	IQ	Raw Score "Portugee" (Easy)	Proportion (# correct/51 items)	Raw Score (Hard) "French Foreign Legion"	Proportion (# correct/45 items)
61-A.R.	191	71	24	.470	15	.333
62-S.G.	205	80	19	.372	15	.333
63-B.C.	182	75	42	.823	33	.733
64-P.R.	182	84	42	.823	25	.555
65-F.S.	219	68	24	.470	17	.377
66-S.P.	142	84	17	.333	13	.288
67-S.J.	207	84	24	.647	19	.422
68-H.R.	183	74	16	.313	11	.244
69-A.C.	190	72	15	.294	13	.288
70-H.D.	188	62	44	.862	22	.488

*Low Comprehension/Fast Speed

LC/SS*

71-L.G.	163	69	28	.549	16	.355
72-R.B.	193	60	20	.392	13	.288
73-W.E.	202	77	45	.882	26	.577
74-L.E.	185	73	41	.803	24	.533
75-S.A.	187	59	30	.588	14	.311
76-M.G.	233	71	32	.627	20	.444
77-F.W.	182	82	44	.862	26	.577
78-M.G.	157	80	35	.686	25	.555
79-M.H.	212	74	31	.607	18	.400
80-S.W.	186	60	9	.176	10	.222

*Low Comprehension/Slow Speed

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Note: These secondary sources were not available in their original form. They were drawn from an extensive annotated bibliography of listening research developed by S. Duker (1968) and are included as pertinent to the development of the problem.

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